

AD-4212A/B

AD-4212A-100/200/600/1000

AD-4212B-23/101/102/201/301

Production Weighing Unit

INSTRUCTION MANUAL



© 2009 A&D Company, Limited. All rights reserved.

No part of this publication may be reproduced, transmitted, transcribed, or translated into any language in any form by any means without the written permission of A&D Company, Limited.

The contents of this manual and the specifications of the instrument covered by this manual are subject to change for improvement without notice.

Windows and Excel are registered trademarks of Microsoft Corporation.

CONTENTS

1. INTRODUCTION.....	4
1-1 Features	4
1-2 Compliance	5
2. UNPACKING THE BALANCE	6
2-1 Unpacking	6
2-2 Installing the Balance	8
3. PRECAUTIONS	10
3-1 Before Use	10
3-2 When Building into a System	11
3-3 During Use	13
3-4 After Use.....	13
3-5 Power Supply	13
4. DISPLAY SYMBOLS AND KEY OPERATION.....	14
5. WEIGHING UNITS	15
5-1 Units	15
5-2 Changing the Unit.....	17
6. WEIGHING.....	18
6-1 Basic Operation (Gram Mode)	18
6-2 Smart Range Function	19
7. CHANGING THE WEIGHING SPEED	20
8. CALIBRATION.....	21
8-1 Calibration	22
8-2 Calibration Test.....	24
9. FUNCTION SWITCH AND INITIALIZATION	26
9-1 Permit or Inhibit	26
9-2 Initializing the Balance.....	27

10. FUNCTION TABLE	28
10-1 Structure and Sequence of the Function Table	28
10-2 Display and Keys	28
10-3 Details of the Function Table	29
10-4 Description of the Class "Environment, Display"	33
10-5 Description of the Item "Data output mode"	35
10-6 Description of the Item "Data format"	36
10-7 Description of the Data Format Added to the Weighing Data	38
10-8 Data Format Examples	39
10-9 Clock and Calendar Function	40
10-10 Comparator Function	42
11. ID NUMBER AND GLP REPORT.....	46
11-1 Setting the ID Number	46
11-2 GLP Report	47
12. COUNTING MODE (PC)	50
13. PERCENT MODE (Pct).....	52
14. DATA MEMORY	53
14-1 Notes on Using Data Memory	53
14-2 Memory for Weighing Data	54
14-3 Memory for Calibration and Calibration Test Data	57
14-4 Memory for Unit Mass in the Counting Mode	58
14-5 Memory for Upper/lower limit values	59
15. PROGRAMMABLE-UNIT (AD-4212A only)	62
16. I/O UNIT SPECIFICATIONS (Standard interface)	63
16-1 RS-232C/Comparator Contact Output/External Contact Input	63
17. CONNECTION TO PERIPHERAL EQUIPMENT	65
17-1 Connection to the AD-8121B Printer	65
17-2 Connection to a Computer	66
17-3 Using Windows Communication Tools (WinCT)	66

18. COMMANDS.....	68
18-1 Command List	68
18-2 Acknowledge Code and Error Codes	69
18-3 Control Using CTS and RTS	70
18-4 Settings Related to RS-232C	70
19. BCD OUTPUT (OP-01)	71
19-1 Connector Pin Nos. and Specifications	71
20. EXTENDED FUNCTIONS (AD-4212A only)	74
20-1 Description of "Averaging range" and "Averaging time"	76
21. MAINTENANCE	77
22. TROUBLESHOOTING	77
22-1 Checking the Balance Performance and Environment	77
22-2 Error Codes	79
22-3 Asking For Repair	81
23. SPECIFICATIONS	82
24. DESIGNING A SPECIAL WEIGHING PAN.....	84
25. INSTALLING THE DISPLAY UNIT	90
26. ATTACHING THE MOUNTING FIXTURES.....	91
27. EXTERNAL DIMENSIONS	92
28. OPTIONS	94
29. TERMS/INDEX.....	96

1. INTRODUCTION

This manual describes how the AD-4212A/B series balance works and how to get the most out of it in terms of performance.

Read this manual thoroughly before using the balance and keep it at hand for future reference.

1-1 Features

- Separate Weighing Unit and Display (standard connection cable length 2 m), suitable for building into a production line system. The weighing unit is compact, with a width of 80 mm.
- High Resolution and High Response Speed

Model	Weighing capacity	Minimum weighing value	Stabilization time *1
AD-4212A-100	110 g	0.1 mg	1.1 to 1.3 seconds
AD-4212A-200	210 g	1 mg	0.8 to 1.0 second
AD-4212A-600	610 g		0.9 to 1.1 seconds
AD-4212A-1000	1100 g		
AD-4212B-23	21g	0.001mg	12 seconds
AD-4212B-101	110 g / 31 g	0.1 mg / 0.01 mg	2.5 / 4.0 seconds *2
AD-4212B-102	110 g	0.01 mg	4.0 seconds *3
AD-4212B-201	210 g	0.1 mg	2.5 seconds
AD-4212B-301	310 g		

*1 With **FAST** selected under good environment

*2 The AD-4212B-101 is equipped with a smart range function. When the minimum weighing value is set to 0.01 mg and the weight value exceeds 31 g, the minimum weighing value will switch to 0.1 mg automatically. Even under this circumstance, pressing the **RE-ZERO** key tares the value and weighing with the minimum weighing value of 0.01 mg is available up to 31 g.

*3 2.5 seconds when the minimum weighing value is 0.1 mg.

- Standard RS-232C Serial Interface / Standard Comparator Contact Output (*4)

Using the RS-232C serial interface, weighing data can be output to external devices and the balance can be controlled by external devices.

Using comparator contact output, the weight value is compared to the preset upper/lower limit values and the results are displayed as **HI**, **OK** or **LO**. The buzzer is also available in response to the results.

The RE-ZERO operation is possible using a signal from an external contact input, which allows easy system construction. (This function is only available when the external contact input is installed on the standard interface or OP-01.)

*4 AD-4212A series balance: 3-level output.

AD-4212B series balance: 3-level or 5-level output, switched by the function table setting.

- Data Memory Function, storing weighing data, calibration data, unit mass in the counting mode or upper/lower limit values. Once stored, selection of the upper or lower limit value is easy.
- Dust-protected and Protected Against Splashing Water (Complying with IP54)

- Clock and Calendar Function, adding the time and date to the output data.
- GLP/GMP Output, using the RS-232C serial interface.
- Reference Sheet, provided for a quick reference to the balance operation.
- Windows Communication Tools (WinCT), allows easy communication with a Windows-based personal computer.

Windows is a registered trademark of Microsoft Corporation.

- Multiple Weighing Units, with most of the common units used around the world.
- Auto display-ON Function, that displays the weighing mode without any key operation when the AC adapter is plugged in, is available.
- Stainless Steel Casing with high chemical resistance for the AD-4212B weighing unit
- Stainless Steel Breeze Break, provided for the AD-4212B series balance and the AD-4212A-100, for more accurate weighing. For the other models, it is available as an option (OP-19).
- BCD Output (OP-01) and Ethernet Interface (OP-08) are available as options

1-2 Compliance

Compliance with FCC Rules

Please note that this equipment generates, uses and can radiate radio frequency energy. This equipment has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when the equipment is operated in a commercial environment. If this unit is operated in a residential area, it may cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)

Compliance with EMC Directives

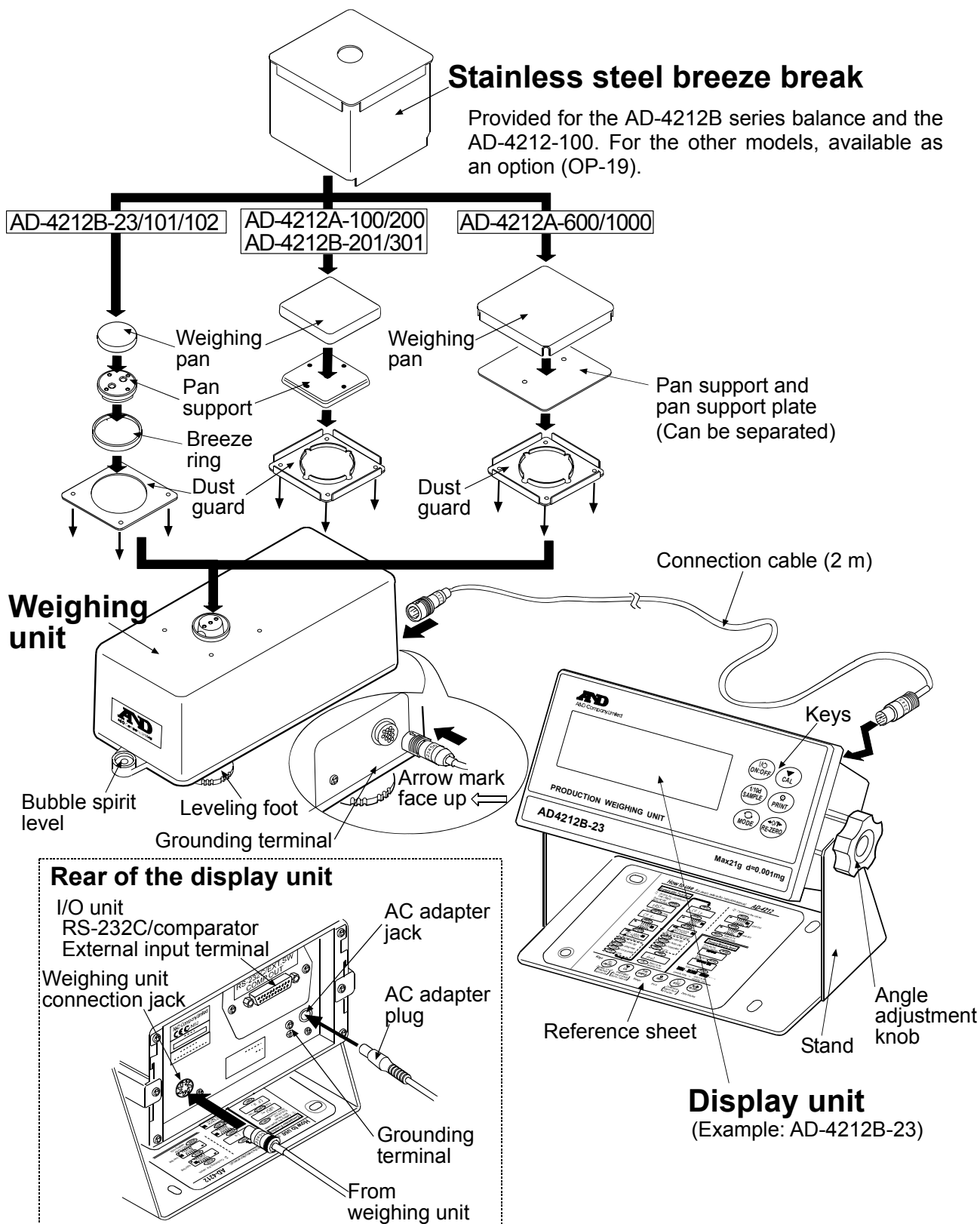


This device features radio interference suppression in compliance with valid EC Regulation 89/336/EEC.

2. UNPACKING THE BALANCE

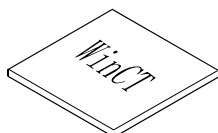
2-1 Unpacking

- The balance is a precision instrument. Unpack the balance carefully. Keep the packing material to be used for transporting the balance in the future.
- See the illustrations to confirm that everything is contained.

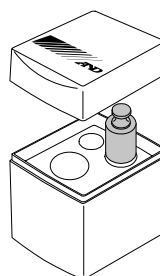


Accessories

Windows communication
tools (WinCT)



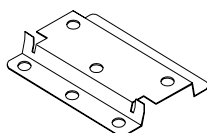
Calibration weight
OIML, Class E2 or equivalent



*(AD-4212B-23 only)

Model	Weight
AD-4212B-23*	1g
AD-4212A-100 AD-4212B-101/102	50g
AD-4212A-200 AD-4212B-201/301	100g
AD-4212A-600/1000	200g

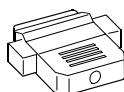
Mounting fixture (2 pcs.)



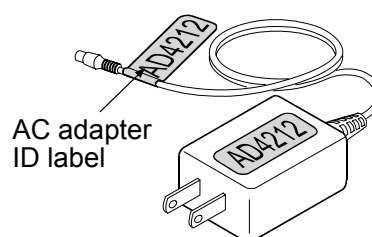
Screw and washers
to attach the mounting fixture
(3 sets)



D-Sub 25-pin connector
To mate with the I/O unit.



AC adapter



Notes

- About how to attach the mounting fixtures, refer to “26. ATTACHING THE MOUNTING FIXTURES” on page 91.
- Please confirm that the AC adapter type is correct for your local voltage and receptacle type.

2-2 Installing the Balance

Caution

- The weighing unit and the display unit were adjusted as a unit. Therefore, make sure that the weighing unit and the display unit have the same serial number. The serial number is printed on the rear of the weighing unit and the display unit. The connection cable also carries the serial number.
If the serial numbers of both units are different, the balance may not function properly. When a repair is necessary, submit both the weighing unit and the display unit for repair.
- There is no compatibility between The AD-4212A and the AD-4212B or AD-4212, for both the weighing unit and the display unit.

Install the balance as follows:

1. Refer to "3. PRECAUTIONS" for installing the balance.
2. Refer to "2-1 Unpacking" on the previous page to attach the dust guard, the breeze ring (AD-4212B-23/101/102 only), the pan support and the weighing pan on the weighing unit.
The stainless steel breeze break is provided for the AD-4121B series balance and the AD-4212A-100 as a standard accessory, and for the other models as an option. Use it as necessary when performing calibration or checking accuracy.

How to install the breeze break

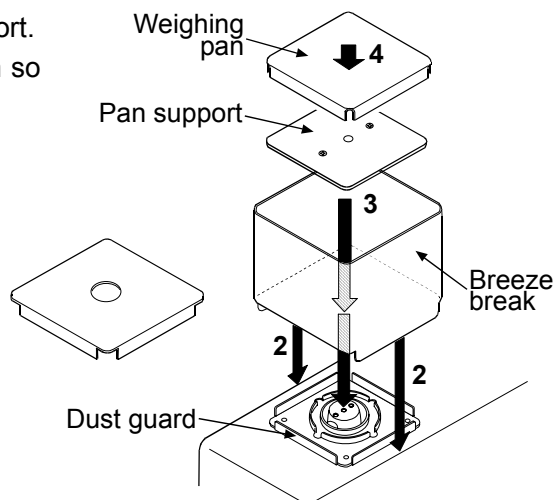
- AD-4212A-100/200 and the AD-4212B series balance

Place the breeze break on the weighing pan so that it fits over the dust guard.

- AD-4212A-600/1000

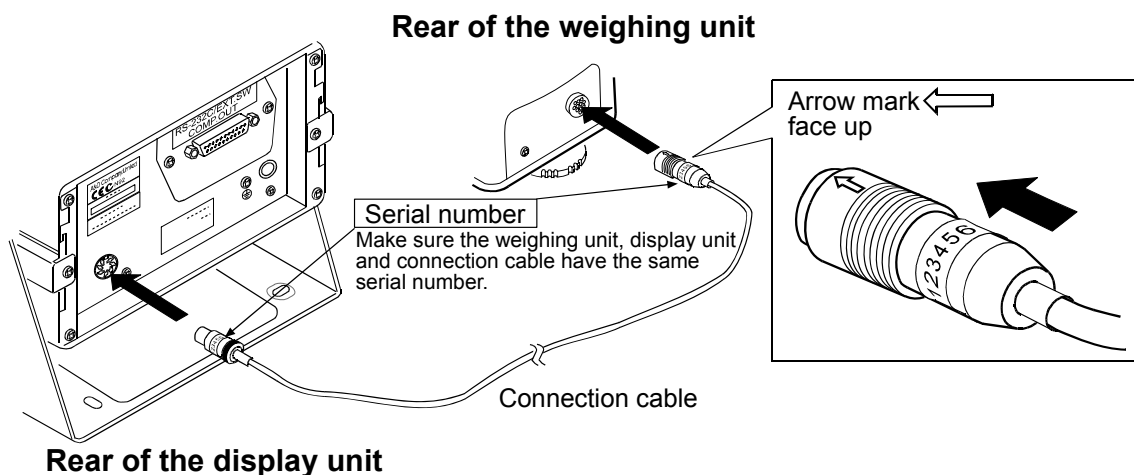
Follow the procedure below to install the breeze break.

- 1 Remove the weighing pan and the pan support.
- 2 Place the breeze break on the weighing pan so that it fits over the dust guard.
- 3 Replace the pan support.
- 4 Replace the weighing pan.



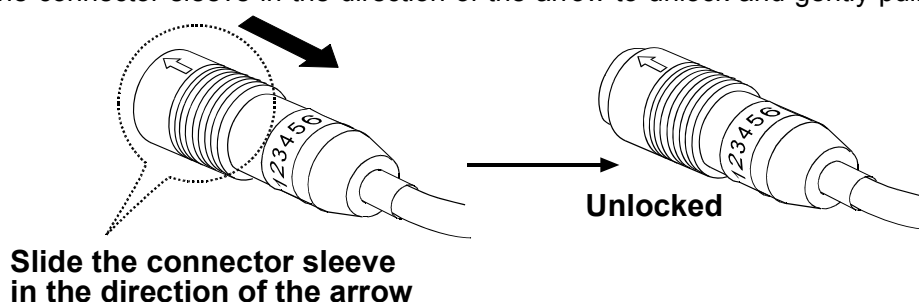
3. Connect the weighing unit and the display unit, firmly inserting one end of the connection cable into the jack located on the rear of the weighing unit and the other end into the jack located on the rear of the display unit.

If the extension cable (OP-07: 3 m) is used, connect it between the connection cable and the display unit.



How to disconnect the cable from the weighing unit

Slide the connector sleeve in the direction of the arrow to unlock and gently pull the connector out.



4. Adjust the leveling feet to level the weighing unit. Confirm it using the bubble spirit level.
5. Confirm that the adapter type is correct for the local voltage and power receptacle type.
6. Plug the AC adapter plug into the AC adapter jack located on the rear of the display unit and plug the AC adapter into the electrical outlet. Warm up the balance for the appropriate duration with nothing on the weighing pan.
 - AD-4212A series balance: 30 minutes or more
 - AD-4212B series balance: one hour or more
7. Set the pan unit and I/O unit to adapt to the peripheral system. Set the following for the I/O unit.
 - RS-232C (Refer to page 63)
 - Comparator contact output (Refer to page 64)
 - RE-ZERO operation using external contact input (Refer to page 64)
 - Auto-display ON function (Refer to pages 29 and 34)

Set the weighing speed to adapt to the ambient conditions.

8. After the balance has been installed, calibrate the balance using the calibration weight provided with the balance. For details, refer to "8. CALIBRATION".
9. A special weighing pan designed appropriately for the sample to be weighed or the peripheral system can be attached to the balance. About how to design a weighing pan, refer to "24 DESIGNING A SPECIAL WEIGHING PAN".

3. PRECAUTIONS

To get the optimum performance from the balance and acquire accurate weighing data, note the following:

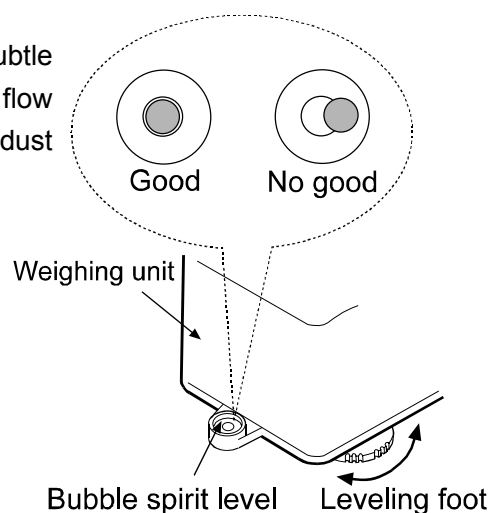
3-1 Before Use

- Install the balance in an environment where the temperature and humidity are not excessive. The best operating temperature is about 20°C / 68°F at about 50% relative humidity.
- Install the balance where it is not exposed to direct sunlight and it is not affected by heaters or air conditioners.
- Install the balance where it is free of dust.
- Install the balance away from equipment which produces magnetic fields.
- Install the balance in a stable place avoiding vibration and shock. Corners of rooms on the first floor are best, as they are less prone to vibration.
- The AD-4212A/B series balance responds even to very subtle air flow. To avoid the influence of ambient air flow or air flow caused by balance operation, make sure to use the dust guard and the breeze ring (AD-4212B-101/102 only).
- Level the weighing unit by adjusting the leveling feet and confirm it using the bubble spirit level.
- If the leveling adjustment is difficult to perform due to the installation conditions, perform calibration using a calibration weight or controlled actual sample before weighing.
- Ensure a stable power source when using the AC adapter
- Warm up the balance for the appropriate duration. Plug in the AC adapter as usual.
 - AD-4212A series balance: 30 minutes or more
 - AD-4212B series balance: one hour or more

In the case of the AD-4212B-23 high-precision model (minimum display: 0.001mg), warm up the balance usually (if possible, keep connected the AC adapter connected to power at all times).

- Calibrate the balance before use or after having moved it to another location.

In addition, calibrate it periodically to maintain the accuracy.



Caution

Do not install the balance where flammable or corrosive gas is present.

3-2 When Building into a System

The AD-4212A/B is a precision balance. When it is built into a system and used, errors such as unstable weight values may occur due to static electricity, vibration and materials used for the devices near the balance.

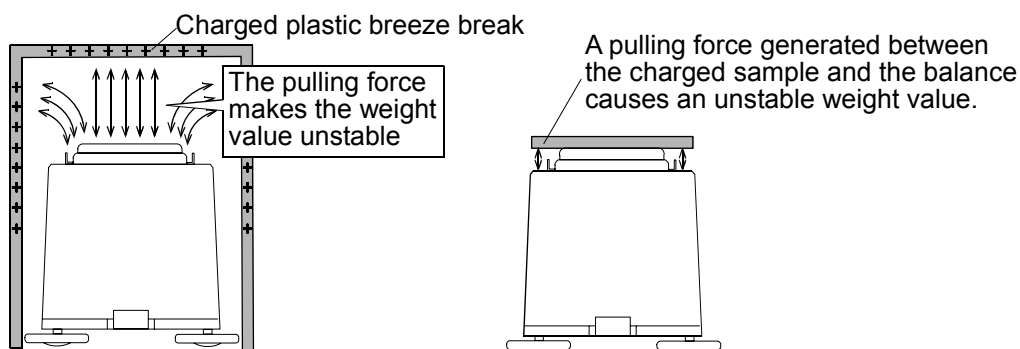
When using the balance that is built into a system, take the following precautions.

- Errors due to a static charge

When the ambient humidity is less than 45% RH, insulators such as plastic or glass are prone to static electricity. When charged material comes close to the balance, a pulling force is generated between the charged material and the weighing pan. This causes an unstable weight value.

To protect the balance against a discharge generated by charged material when it comes close to the balance, make sure to earth ground the weighing unit and the display unit.

(Static electricity generated by static induction will not be canceled by earth-grounding.)



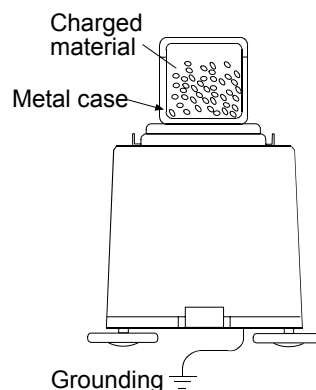
Measures to take (Plastic is used in the measures below. They can be applied to glass, too.)

- When the sample or devices are plastic

- Use a static eliminator that generates no air blow such as the AD-1683, DC static eliminator, to remove static electricity.
- Place the sample in a container that is made of a conductive material such as metal and that can be sealed and weigh it.

- When the sample is powdery

- When the balance is used in combination with a feeder for batch weighing of powdery samples, samples may be charged by rubbing sample particles against each other. Use a static eliminator and perform weighing while removing static electricity.



- When the sample container is made of material that is prone to static electricity such as plastic

- Cover the outside of the container with a metal such as aluminum foil.
- Apply an anti-static agent onto the container.

- When making a breeze break using plastic

- Apply an anti-static agent onto the breeze break.
- Use a conductive acrylic fiber.

- When plastic exists in the balance installation site

- Cover the plastic with a grounded metal.

- Apply an anti-static agent onto plastic.
- When an operator is static charged

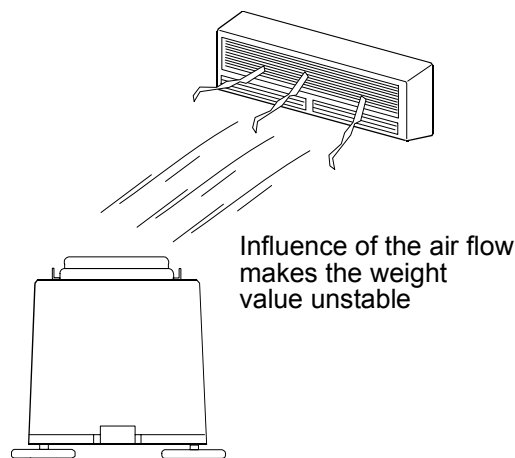
If an operator's clothes are static charged, especially in winter, it may be a cause for unstable weight values.

 - Wear an anti-static wrist strap.

● Errors due to air flow

- Where the influence of ambient air flow is great such as: close to an air conditioner, door or passage way. Even very subtle air flow that is hard to be detected may influence the weighing operation.

- Avoid those areas as a weighing site.
- If weighing is to be performed in such an area, use a breeze break or take other appropriate measures.



- Where the influence of heat or drafts is great

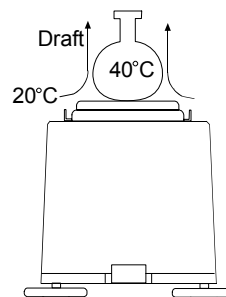
- Eliminate temperature differences between a sample and the environment.

When a sample is warmer (cooler) than the ambient temperature, the sample will be lighter (heavier) than the true weight. This error is due to a rising (falling) draft around the sample.

- Do not touch the sample directly with your hand. Use tweezers or other tools.

If you touch the sample, the same type error described above will occur.

- Do not perform weighing where it is exposed to direct sunlight. Weighing errors may occur due to sudden temperature change or drafts.



- Where the influence of vibration is great, such as:

(1) Soft ground (2) Second or higher floor (3) Near center of a floor far from pillars (4) Seismic isolated structures (5) Near tall buildings.

In the areas listed above, the scale may yield unstable weight values on windy days or after an earthquake. Especially in case of (4) and (5), weight values may be unstable during and for a long period of time after strong winds or an earthquake.

● Errors due to other causes

- Change in temperature or humidity

A sudden change in temperature or humidity can generate a draft and cause the balance to absorb or exude moisture, which leads to weighing errors.

- Avoid sudden change in temperature or humidity.
- Use an air conditioner to control the temperature or humidity.

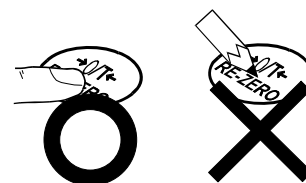
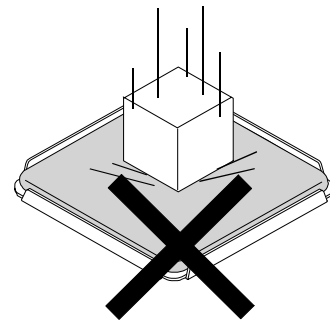
□ Magnetic material

The balance uses a strong magnet as part of the balance assembly, so use much care when weighing magnetic materials.

- Place a non-magnetic object such as aluminum or brass between the sample and the balance, also keep an appropriate distance between them while weighing.

3-3 During Use

- To minimize the affect by electrical noises, earth ground the weighing unit and the display unit.
- Make each weighing gently and quickly to avoid errors due to changes in the environmental conditions.
- Do not drop things upon the weighing pan, or place a sample on the pan that is beyond the balance weighing capacity. Place a sample in the center of the weighing pan.
- Do not use a sharp instrument such as a pencil to press the keys. Use your finger only.
- Press the **RE-ZERO** key before each weighing to prevent possible errors. In addition, a RE-ZERO signal can be sent using external contact input/RS-232C command.
- Take into consideration the affect of air buoyancy on a sample when more accuracy is required.
- Keep the balance interior free of dust and foreign materials.



3-4 After Use

- Avoid mechanical shock to the balance.
- Calibrate the balance, using a calibration weight, periodically.
- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.
- Avoid dust and water so that the balance weighs correctly. Protect the internal parts from liquid spills and excessive dust.

3-5 Power Supply

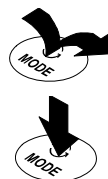
- When the AC adapter is connected, the balance is in the standby mode if the standby indicator is on (refer to “4 DISPLAY SYMBOLS AND KEY OPERATION”). This is a normal state and does not harm the balance. For accurate weighing, plug in the AC adapter and warm up the balance for the appropriate duration before use.

4. DISPLAY SYMBOLS AND KEY OPERATION

Key operation

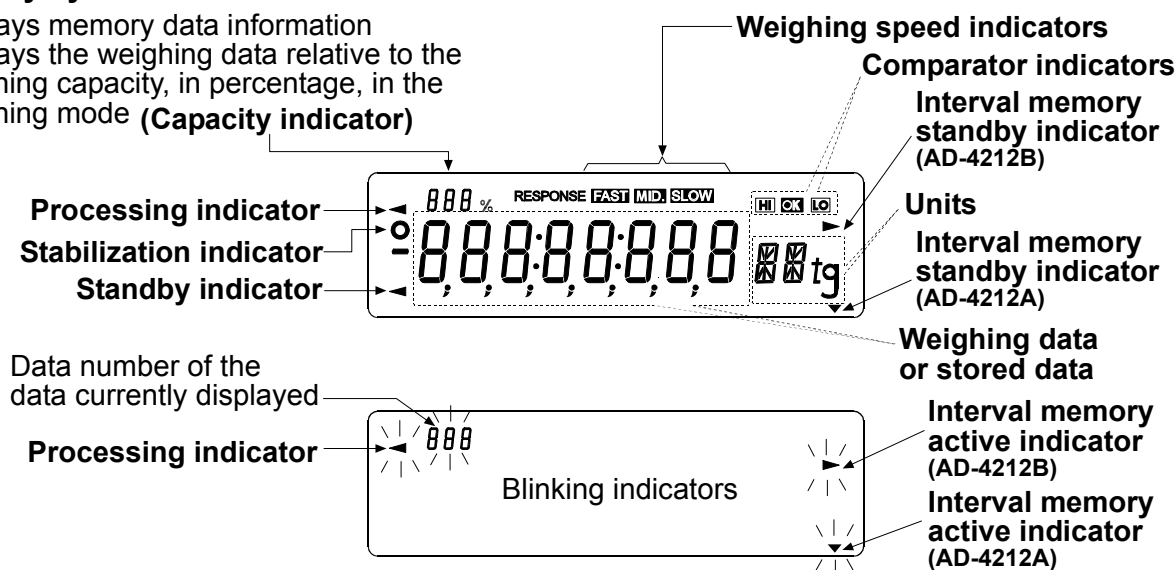
Key operation affects how the balance functions. The basic key operations are:

- “Press and release the key immediately” or “Press the key”
= normal key operation during measurement
- “Press and hold the key”



Display symbols

- Displays memory data information
- Displays the weighing data relative to the weighing capacity, in percentage, in the weighing mode (**Capacity indicator**)



Each key, when pressed or when pressed and held, functions as follows:

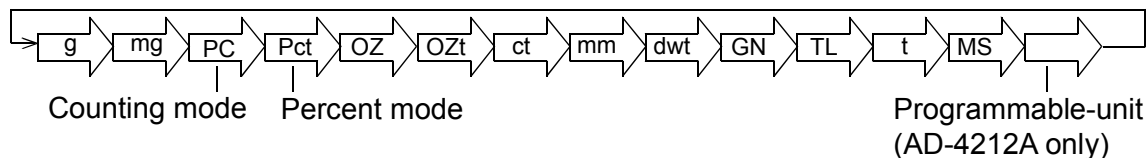
Key	When pressed	When pressed and held
	Turns the display ON and OFF. The standby indicator is displayed when the display is turned off. The weighing mode is enabled when the display is turned on. This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display OFF.	
	In the weighing mode, switches the minimum weighing value. * In the counting or percent mode, enters the sample storing mode.	Enters the function table mode. Refer to “10. FUNCTION TABLE”.
	Displays the upper/lower limit values currently set. Switches between the upper and lower limit values when they are stored in memory.	Performs weighing speed adjustment.
	No function.	Enters the calibration mode.
	Stores the weighing data in memory or outputs to a printer or personal computer depending on the function table settings. (Factory setting = output) Not available when OP-01 is installed.	No function at the factory setting By changing the function table setting: Outputs “Title block” and “End block” for GLP report. Displays the data memory menu.
	Sets the display to zero.	

* The factory setting of the minimum weighing value for the AD-4212B-101/102 is 0.1 mg.

5. WEIGHING UNITS

5-1 Units

With the AD-4212A/B series balance, the following weighing units and weighing modes are available:



A unit or mode can be selected and stored in the function table as described in “5-2 Changing the Unit”. If a weighing mode (or unit of weight) has been turned off, that mode or unit will be missing in the sequence. Tael has four varieties, one of which can be selected and installed at the factory.

For details about the units and modes, see the table below:

Name (unit, mode)	Display	Function table (Storing mode)	Conversion factor
Gram	g	g	1 g
Milligram	m g	m g	0.001 g
Counting mode	PC	PC	—
Percent mode	Pct	Pct	—
Ounce (Avoir)	OZ	OZ	28.349523125 g
Troy Ounce	OZt	OZt	31.1034768 g
Metric Carat	ct	ct	0.2 g
Momme	mm	mm	3.75 g
Pennyweight	dwt	dwt	1.55517384 g
Grain (UK)	GN	GN	0.06479891 g
Tael (HK general, Singapore)	TL	TL	37.7994 g
Tael (HK jewelry)			37.429 g
Tael (Taiwan)			37.5 g
Tael (China)			31.25 g
Tola (India)	t	t	11.6638038 g
Messghal	MS	MS	4.6875 g
Programmable-unit (Multi-unit) (AD-4212A only)	—	MS t	—

The table below indicates the weighing capacity and the minimum display for each unit, depending on the balance model.

Unit	AD-4212A-100		AD-4212A-200		AD-4212A-600		AD-4212A-1000	
	Capacity	Minimum display	Capacity	Minimum display	Capacity	Minimum display	Capacity	Minimum display
Gram	110	0.0001	210	0.001	610	0.001	1100	0.001
Milligram	110000	0.1	210000	1	610000	1	1100000	1
Ounce (Avoir)	3.88	0.000005	7.40	0.00005	21.51	0.00005	38.80	0.00005
Troy Ounce	3.53	0.000005	6.75	0.00005	19.61	0.00005	35.36	0.00005
Metric Carat	550	0.0005	1050	0.005	3050	0.005	5500	0.005
Momme	29.3	0.00005	56.0	0.0005	162.6	0.0005	293.3	0.0005
Pennyweight	70.7	0.0001	135.0	0.001	392.2	0.001	707.3	0.001
Grain (UK)	1697	0.002	3240	0.02	9413	0.02	16975	0.02
Tael (HK general, Singapore)	2.91	0.000005	5.55	0.00005	16.13	0.00005	29.10	0.00005
Tael (HK jewelry)	2.93	0.000005	5.61	0.00005	16.29	0.00005	29.38	0.00005
Tael (Taiwan)	2.93	0.000005	5.60	0.00005	16.26	0.00005	29.33	0.00005
Tael (China)	3.52	0.000005	6.72	0.00005	19.52	0.00005	35.20	0.00005
Tola (India)	9.43	0.00001	18.00	0.0001	52.29	0.0001	94.30	0.0001
Messghal	23.4	0.00005	44.8	0.0005	130.1	0.0005	234.6	0.0005

Unit	AD-4212B-23		AD-4212B-101			
			Standard range		Precision range	
	Capacity	Minimum display	Capacity	Minimum display	Capacity	Minimum display
Gram	21	0.000001	110	0.0001	31	0.00001
Milligram	21000	0.001	110000	0.1	31000	0.01
Ounce (Avoir)	0.741	0.0000001	3.88	0.00001	1.09	0.000001
Troy Ounce	0.675	0.0000001	3.53	0.00001	0.99	0.000001
Metric Carat	105	0.00001	550	0.001	155	0.0001
Momme	5.60	0.000001	29.3	0.0001	8.2	0.00001
Pennyweight	13.50	0.000001	70.7	0.0001	19.9	0.00001
Grain (UK)	324.1	0.00002	1697	0.002	478	0.0002
Tael (HK general, Singapore)	0.556	0.0000001	2.91	0.00001	0.82	0.000001
Tael (HK jewelry)	0.561	0.0000001	2.93	0.00001	0.82	0.000001
Tael (Taiwan)	0.560	0.0000001	2.93	0.00001	0.82	0.000001
Tael (China)	0.672	0.0000001	3.52	0.00001	0.99	0.000001
Tola (India)	1.800	0.0000001	9.43	0.00001	2.65	0.000001
Messghal	4.48	0.000001	23.4	0.0001	6.6	0.00001

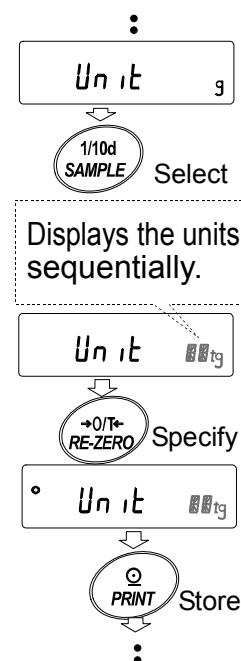
Unit	AD-4212B-102		AD-4212B-201		AD-4212B-301	
	Capacity	Minimum display	Capacity	Minimum display	Capacity	Minimum display
Gram	110	0.00001	210	0.0001	310	0.0001
Milligram	110000	0.01	210000	0.1	310000	0.1
Ounce (Avoir)	3.88	0.000001	7.40	0.00001	10.93	0.00001
Troy Ounce	3.53	0.000001	6.75	0.00001	9.96	0.00001
Metric Carat	550	0.0001	1050	0.001	1550	0.001
Momme	29.3	0.00001	56.0	0.0001	82.6	0.0001
Pennyweight	70.7	0.00001	135.0	0.0001	199.3	0.0001
Grain (UK)	1697	0.0002	3240	0.002	4784	0.002
Tael (HK general, Singapore)	2.91	0.000001	5.55	0.00001	8.20	0.00001
Tael (HK jewelry)	2.93	0.000001	5.61	0.00001	8.28	0.00001
Tael (Taiwan)	2.93	0.000001	5.60	0.00001	8.26	0.00001
Tael (China)	3.52	0.000001	6.72	0.00001	9.92	0.00001
Tola (India)	9.43	0.000001	18.00	0.00001	26.57	0.00001
Messghal	23.4	0.00001	44.8	0.0001	66.1	0.0001

5-2 Changing the Unit

A unit or mode can be selected and stored in the function table.

Select a unit or mode as follows:

- 1 Press and hold the **[SAMPLE]** key until **bASFnC** of the function table is displayed, then release the key.
- 2 Press the **[SAMPLE]** key several times to display **Unit**.
- 3 Press the **[PRINT]** key to enter the unit selection mode.
- 4 Press the **[SAMPLE]** key to select a unit or mode to be used for weighing.
- 5 Press the **[RE-ZERO]** key to specify the unit or mode selected in step 4.
(The stabilization indicator **°** illuminates.)
- 6 Press the **[PRINT]** key to store the unit or mode. The balance displays **End** and then displays the next menu item of the function table.
- 7 Press the **[CAL]** key to exit the function table. Then the balance returns to the weighing mode with the selected unit or mode.



6. WEIGHING

6-1 Basic Operation (Gram Mode)

- 1 Plug in the AC adapter.

- 2 Press the **ON/OFF** key to display the weighing mode. (The decimal point position depends on the balance model.)

Notes

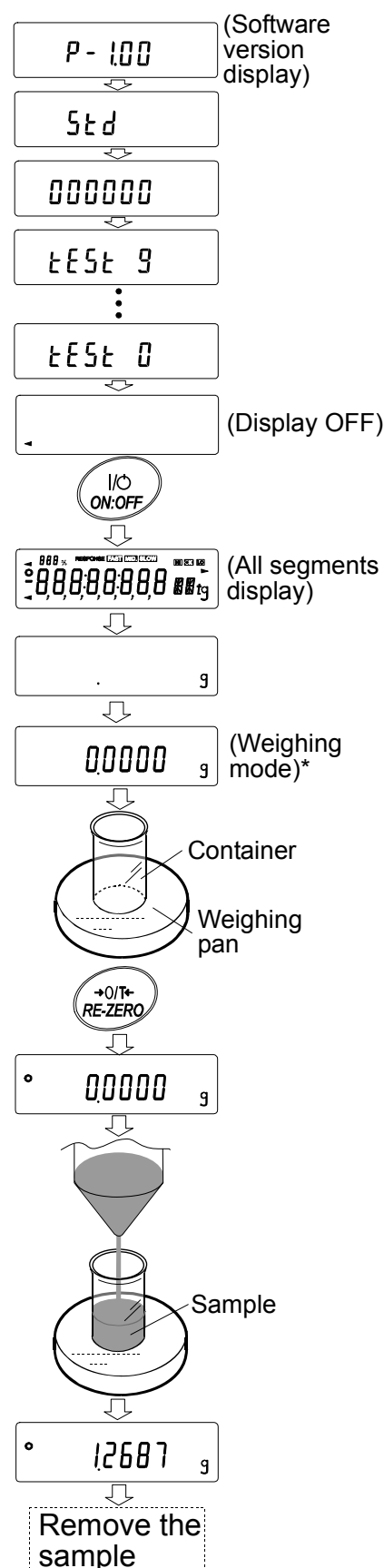
- The auto display-ON function is available to display the weighing mode without the key operation when the AC adapter is plugged in. (Function table: *bASFnC P-on*)
- The function not to tare at start can be selected. (Function table: *bASFnC P-tr*)
For details on the function table settings, refer to "10. FUNCTION TABLE".
- About the minimum display when starting weighing
With the factory setting, the AD-4212B-23 is 0.01 mg, and the AD-4212B-101/102 is 0.1 mg. To display 0.001 mg for the AD-4212B-23, or to display 0.01 mg for the AD-4212B-101/102, press the **SAMPLE** key. Then, make sure to warm up the balance for the appropriate duration.

* In the case of the AD-4212B-23, the displayed unit, when starting weighing, is mg.

- 3 Place a container on the weighing pan, if necessary.
Press the **RE-ZERO** key to cancel the weight (tare). The balance displays **0.0000 g**. (The decimal point position depends on the balance model.)
- 4 Place a sample on the pan or in the container. Wait for the stabilization indicator to be displayed and read the value.
- 5 Remove the sample and container from the pan.

Notes

- To use another unit, refer to "5-2 Changing the Unit".
- Press the **SAMPLE** key to switch the minimum weighing value.
- The function to turn on or off the minimum weighing value automatically when weighing is started can be selected. (Function table: *bASFnC r nG*) For details, refer to "10. FUNCTION TABLE".
- The weighing data can be stored in memory. For details, refer to "14. DATA MEMORY".



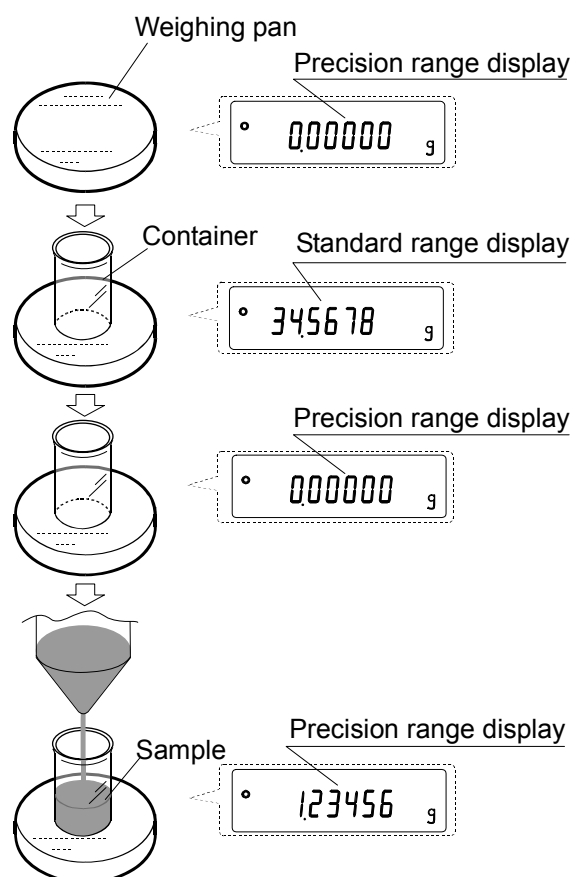
6-2 Smart Range Function

The AD-4212B-101 is equipped with two ranges. The precision range has a higher resolution. The standard range has normal resolution.

The range switches automatically, depending on the value displayed. Pressing the **RE-ZERO** key allows weighing in the precision range, regardless of the tare value.

The minimum weighing value can be fixed to 0.1 mg or 1 mg by pressing the **SAMPLE** key.

- 1 Press the **RE-ZERO** key.
The balance will start weighing, using the precision range.
- 2 Place a container on the weighing pan.
The weight value displayed exceeds the precision range value and the balance will switch to the standard range.
- 3 Press the **RE-ZERO** key.
The balance will switch to the precision range.
- 4 Place a sample in the container.
The weight value displayed is within the precision range value and the balance will perform a weighing, using the precision range.



Precision range/standard range value

	Weighing range	Available minimum weighing value
Precision range	0 g to 31 g	0.01 mg 0.1 mg 1 mg
Standard range	31 g to 110 g	0.1 mg 1 mg

* The factory setting of the minimum weighing value is 0.1 mg (0.0001 g).

7. CHANGING THE WEIGHING SPEED

The weighing speed can be selected from the following three rates to minimize the influence on weighing that is caused by drafts and/or vibration at the place where the balance is installed.

Indicator	Parameter	Speed	Stability
FAST	[ond 0]	Fast	Sensitive value
MID.	[ond 1]	↑	↓
SLOW	[ond 2]	Slow	Stable value



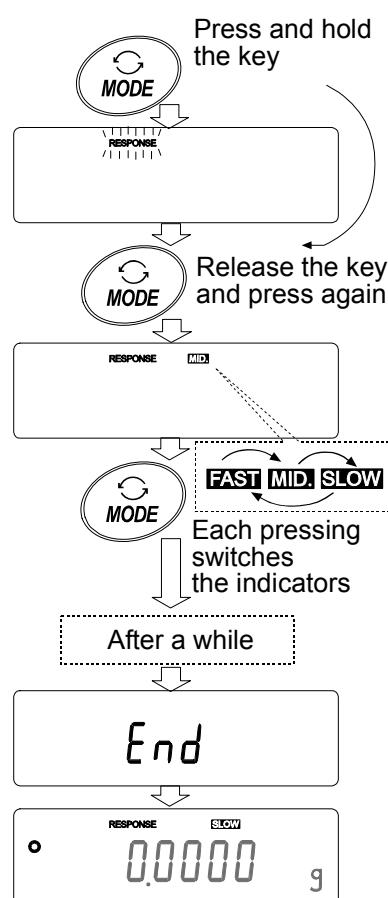
Operation

- 1 Press and hold the **MODE** key until **RESPONSE** is displayed.

And then, press the **MODE** key again quickly.

- 2 Press the **MODE** key to select a weighing speed. Either **FAST**, **MID.** or **SLOW** can be selected.

- 3 After a few seconds of inactivity the balance displays **End**. Then, it returns to the weighing mode and displays the updated weighing speed indicator. The weighing speed indicator remains displayed for a while.



Note

The weighing speed can be changed at “Condition ([ond])” of “Environment, Display (bASFnC)” in the function table. For details, refer to “10. FUNCTION TABLE”.

8. CALIBRATION

Calibration

Calibration using the calibration weight

Calibration test

To check the weighing accuracy, using the calibration weight, and output the result.
(Calibration test does not perform calibration.)

Caution

- Calibration adjusts the balance for accurate weighing.
Besides periodic calibration and before each use, perform calibration when:
 - the balance is installed for the first time.
 - the balance has been moved.
 - the ambient conditions have changed.
- Do not allow vibration or drafts to affect the balance during calibration.
- To output the data for GLP using the RS-232C interface, set "GLP output (*info*)" of "Data output (*data*)". For details, refer to "10. FUNCTION TABLE". Time and date are added to the GLP report. If the time or date is not correct, adjust them. For details, refer to "10-9 Clock and Calendar Function".
- Calibration test is available only when "GLP output (*info*)" of "Data output (*data*)" is set to "1" or "2".
- The calibration and calibration test data can be stored in memory. To store them, set "Data memory (*data*)" to "3". For details, refer to "14. DATA MEMORY".

Caution on using an external calibration weight

- The accuracy of the weight can influence the accuracy of weighing. Select an appropriate weight as listed below. A calibration weight (conforming to OIML, Class E2 or equivalent) is provided with the balance as a standard accessory.

Model	Usable calibration weight	Adjustable range	Calibration weight provided
AD-4212A-100	20 g, 50 g , 100 g	-15.0 mg to +15.9 mg	50 g
AD-4212A-200	20 g, 50 g, 100 g , 200 g	-15 mg to +15 mg	100 g
AD-4212A-600	20 g, 50 g, 100 g, 200 g , 300 g, 400 g, 500 g, 600 g		200 g
AD-4212A-1000	20 g, 50 g, 100 g, 200 g , 300 g, 400 g, 500 g, 600 g, 700 g, 800 g, 900 g, 1000 g		
AD-4212B-23	1 g , 2 g, 5 g, 10 g, 20 g	-1.500 mg to +1.599 mg	1 g
AD-4212B-101	10 g, 20 g, 50 g , 100 g	-15.00 mg to +15.99 mg	50 g
AD-4212B-102			
AD-4212B-201	10 g, 20 g, 50 g, 100 g , 200 g	-15.0 mg to +15.9 mg	100 g
AD-4212B-301	10 g, 20 g, 50 g, 100 g , 200 g, 300 g		

The calibration weight in bold type: factory setting

The calibration weight value can be adjusted within the range above.

Display



- This indicator means "the balance is measuring calibration data". Do not allow vibration or drafts to affect the balance while this indicator is displayed.

8-1 Calibration

This function calibrates the balance using the calibration weight. (Display example: AD-4212B-102)

Operation

- 1 Plug in the AC adapter and warm up the balance with nothing on the pan.
 - AD-4212A series balance: 30 minutes or more
 - AD-4212B series balance: one hour or more

For the models with a minimum display of 0.1 mg, 0.01 mg or 0.001 mg, use the stainless steel breeze break provided with the balance for more accurate weighing.

- 2 Press and hold the **[CAL]** key until **[CAL out]** is displayed, then release the key.

- 3 The balance displays **[CAL 0]**.

- If you want to change the calibration weight (a list of usable weights is shown on page 21), press the **[SAMPLE]** key and proceed to step 4.
- If you use the calibration weight value stored in the balance, proceed to step 5.
- If you want to cancel calibration, press the **[CAL]** key. The balance will return to the weighing mode.

- 4 Specify the calibration weight value as follows:

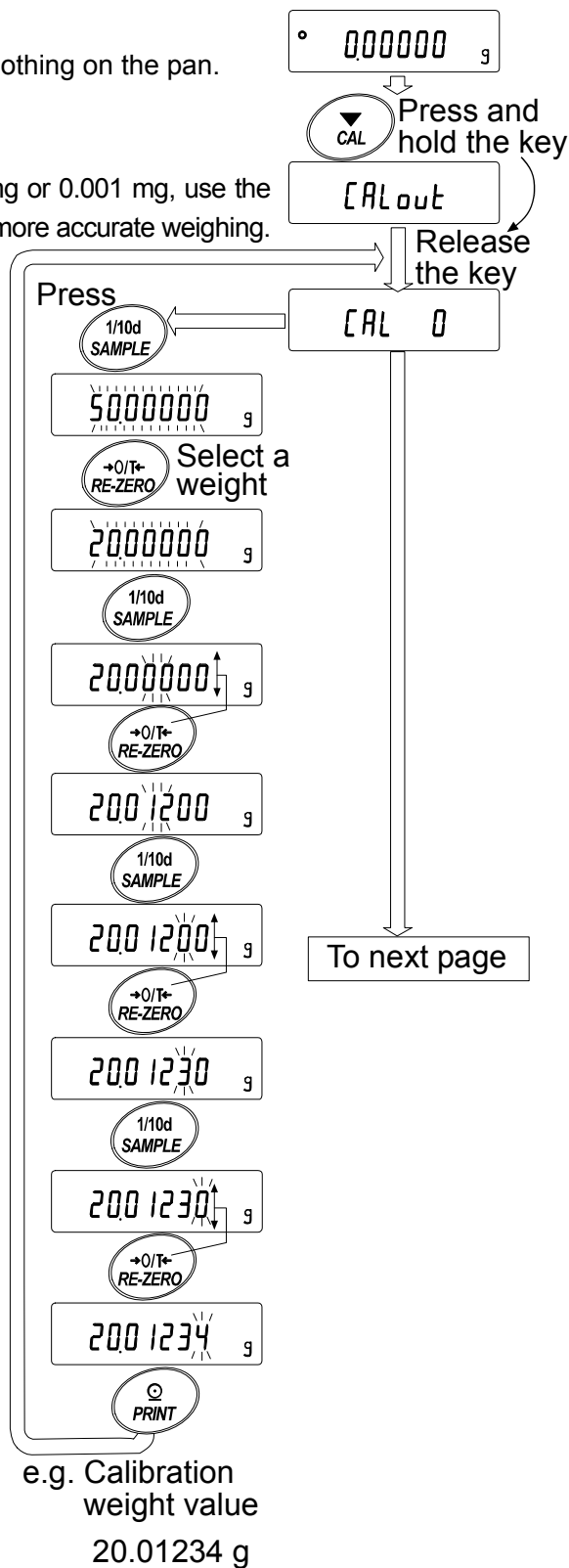
[SAMPLE] key To switch the operation to: calibration weight selection mode (All of the segments blinking) or value adjustment mode (Digits to be changed blinking).

The value can be adjusted to five decimal places for the AD-4212B-101/102 and to six decimal places for the AD-4212B-23.

[RE-ZERO] key To select the calibration weight or adjust the value.

[PRINT] key To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.

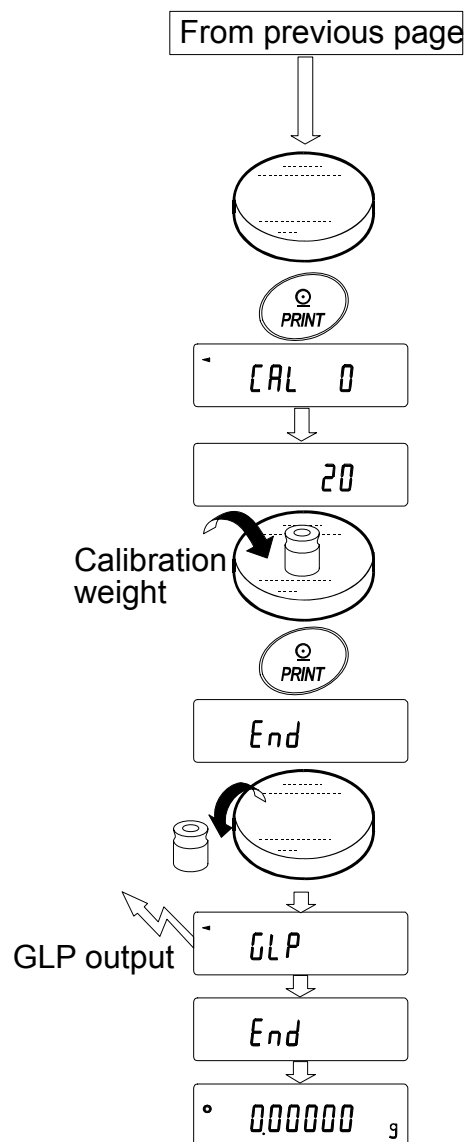
[CAL] key To cancel the operation and return to **[CAL 0]**.



Note

For details about the usable calibration weights and value adjustable range, refer to the previous page.

- 5 Confirm that there is nothing on the pan and press the **PRINT** key. The balance measures the zero point. Do not allow vibration or drafts to affect the balance.
The balance displays the calibration weight value.
- 6 Place a calibration weight, of the weight value displayed, on the pan and press the **PRINT** key. The balance measures the calibration weight. Do not allow vibration or drafts to affect the balance.
- 7 The balance displays **End**. Remove the weight from the pan.
- 8 If the “GLP output (INF0)” parameter, of the function table, is set to “1” or “2”, the balance displays **GLP** and outputs “Calibration Report” using the RS-232C interface or stores the data in memory. For details on the calibration report format, refer to “11-2 GLP Report”.
- 9 The balance will automatically return to the weighing mode.
- 10 Place the calibration weight on the pan and confirm that calibration was performed correctly. If not, check the ambient conditions such as drafts or vibration, and repeat steps 2 through 10.



8-2 Calibration Test

This function tests the balance weighing accuracy using the calibration weight and outputs the result. This is available only when the “GLP output (GLP)” parameter is set to “1” or “2”. (Calibration test does not perform calibration. Display example: AD-4212B-102)

Operation

- 1 Plug in the AC adapter and warm up the balance with nothing on the pan.
 - AD-4212A series balance: 30 minutes or more
 - AD-4212B series balance: one hour or more

For the models with a minimum display of 0.1 mg, 0.01 mg or 0.001 mg, use the stainless steel breeze break provided with the balance for more accurate weighing.

- 2 Press and hold the **CAL** key until **[[out** is displayed, then release the key.

- 3 The balance displays **[[0**.

- If you want to change the calibration weight (a list of usable weights is shown on page 21), press the **SAMPLE** key and proceed to step 4.
- If you use the calibration weight value stored in the balance, proceed to step 5.
- If you want to cancel calibration test, press the **CAL** key. The balance will return to the weighing mode.

- 4 Specify the calibration weight value as follows:

SAMPLE key To switch the operation to: calibration weight selection mode (All of the segments blinking) or value adjustment mode (Digits to be changed blinking).

The value can be adjusted to five decimal places for the AD-4212B-101/102 and to six decimal places for the AD-4212B-23.

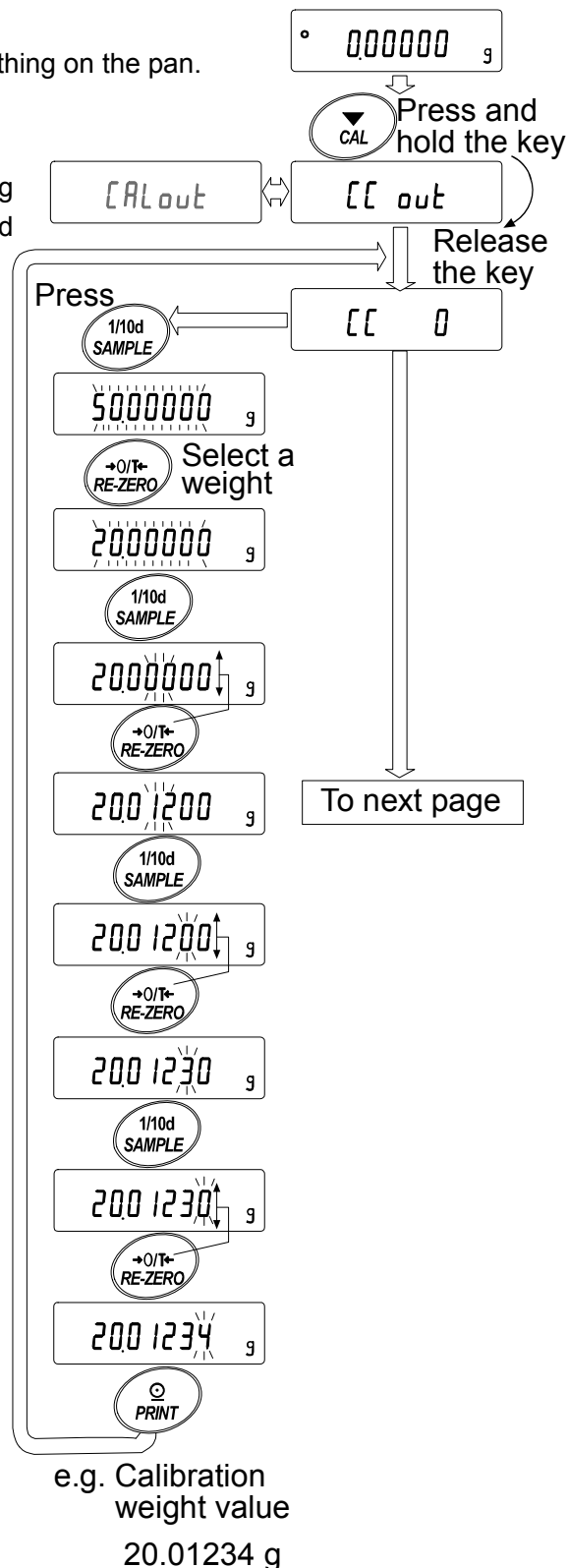
RE-ZERO key To select the calibration weight or adjust the value.

PRINT key To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.

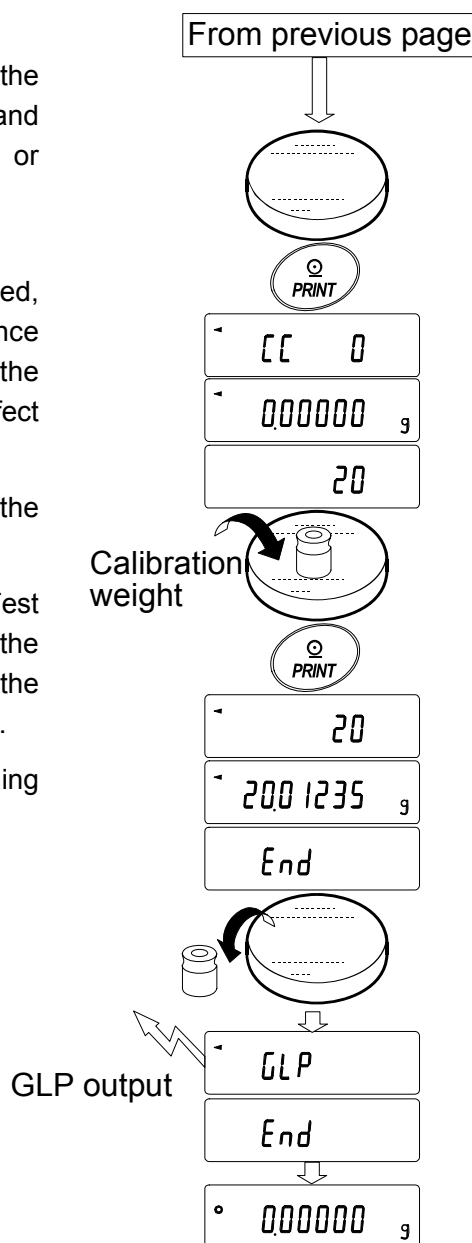
CAL key To cancel the operation and return to **[[0**.

Note

For details about the usable calibration weights and value adjustable range, refer to page 21.



- 5 Confirm that there is nothing on the pan and press the **PRINT** key. The balance measures the zero point and displays the measured value. Do not allow vibration or drafts to affect the balance.
The balance displays the calibration weight value.
- 6 Place a calibration weight, of the weight value displayed, on the pan and press the **PRINT** key. The balance measures the calibration weight and displays the measured value. Do not allow vibration or drafts to affect the balance.
- 7 The balance displays **End**. Remove the weight from the pan.
- 8 The balance displays **GLP** and outputs “Calibration Test Report” using the RS-232C interface or stores the calibration test data in memory. For details on the calibration test report format, refer to “11-2 GLP Report”.
- 9 The balance will automatically return to the weighing mode.

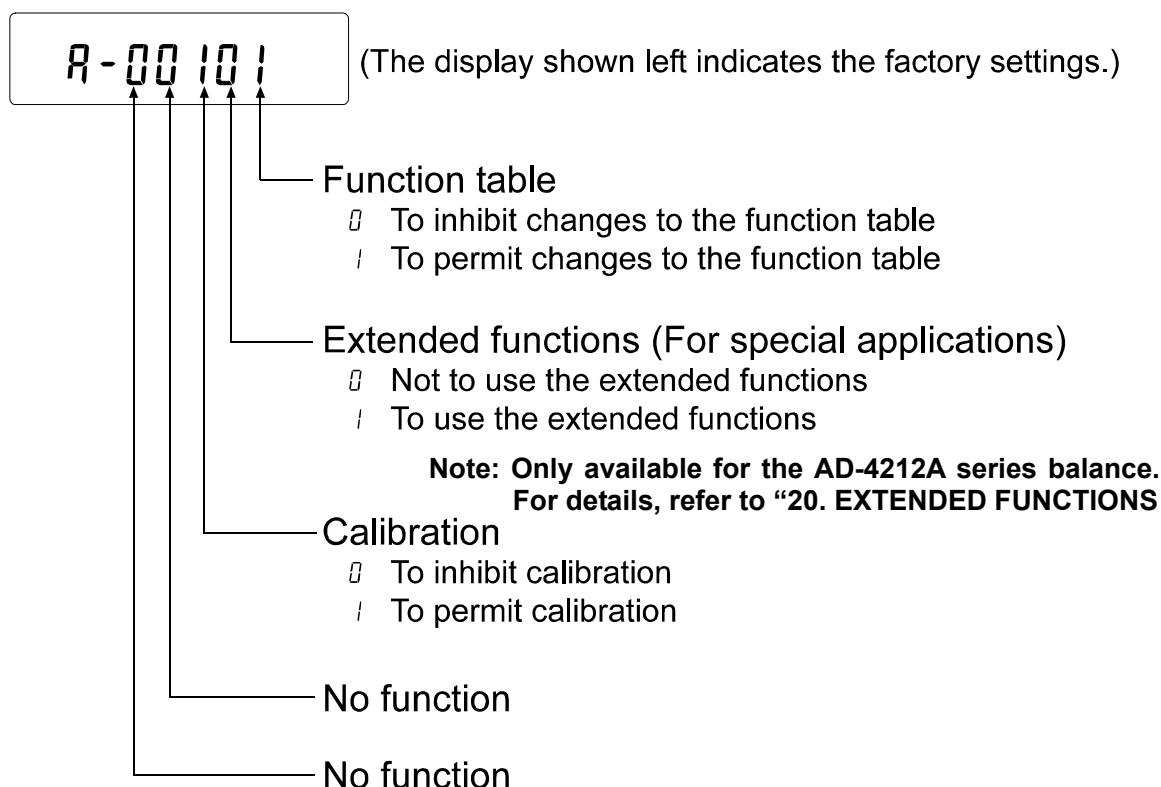


9. FUNCTION SWITCH AND INITIALIZATION

9-1 Permit or Inhibit

The balance stores parameters that must not be changed unintentionally (e.g. Calibration data for accurate weighing, data for adapting to the operating environment, control data for the RS-232C interface). There are two switches for protecting the parameters. The switches can select either “permit” or “inhibit”. The “inhibit” protects parameters against unintentional operations. There is an additional switch for the extended functions of the AD-4212A.

Switches



Operation

- 1 Press the **ON:OFF** key to turn off the display.
- 2 While pressing and holding the **PRINT** key and the **SAMPLE** key, press the **ON:OFF** key. The balance displays **P5**.
- 3 Press the **PRINT** key. Then the balance displays the function switches.
- 4 Set the switches using the following keys.

SAMPLE key To select the switch to change the parameter.

RE-ZERO key To change the parameter of the switch selected.

0: To inhibit changes. 1: To permit changes

PRINT key To store the new parameter and return to the weighing mode.

CAL key To cancel the operation and return to the weighing mode.

9-2 Initializing the Balance

This function returns the following parameters to factory settings.

- Calibration data
- Function table
- Upper/lower limit values
- The sample unit mass value (counting mode), 100% reference mass value (percent mode)
- The data that is stored in the balance using the data memory function
- Calibration weight value
- Function switch settings

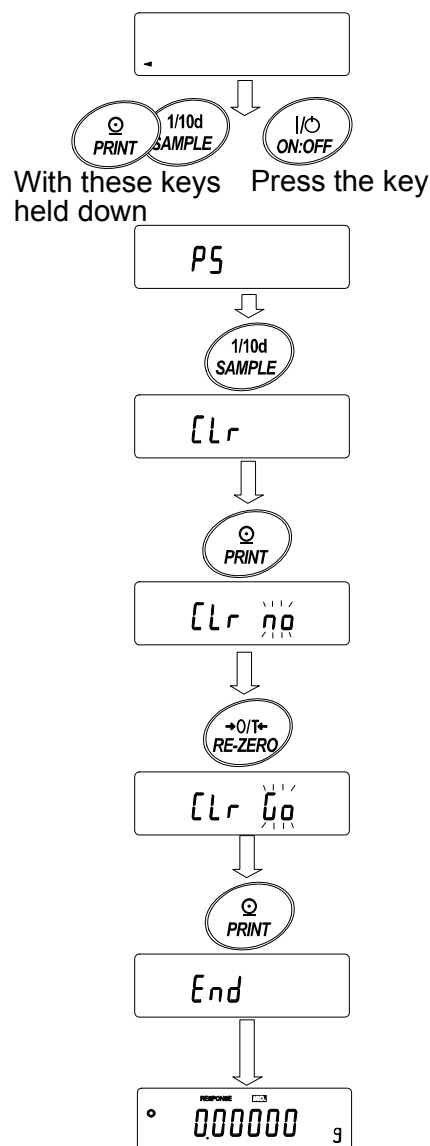
Note

Be sure to calibrate the balance after initialization.

Operation

- 1 Press the **ON:OFF** key to turn off the display.
- 2 While pressing and holding the **PRINT** key and the **SAMPLE** key, press the **ON:OFF** key. The balance displays **P5**.
- 3 Press the **SAMPLE** key to display **ELr**.
- 4 Press the **PRINT** key.
To cancel this operation, press the **CAL** key.
- 5 Press the **RE-ZERO** key.
- 6 Press the **PRINT** key to initialize the balance.

The balance will automatically return to the weighing mode.



10. FUNCTION TABLE

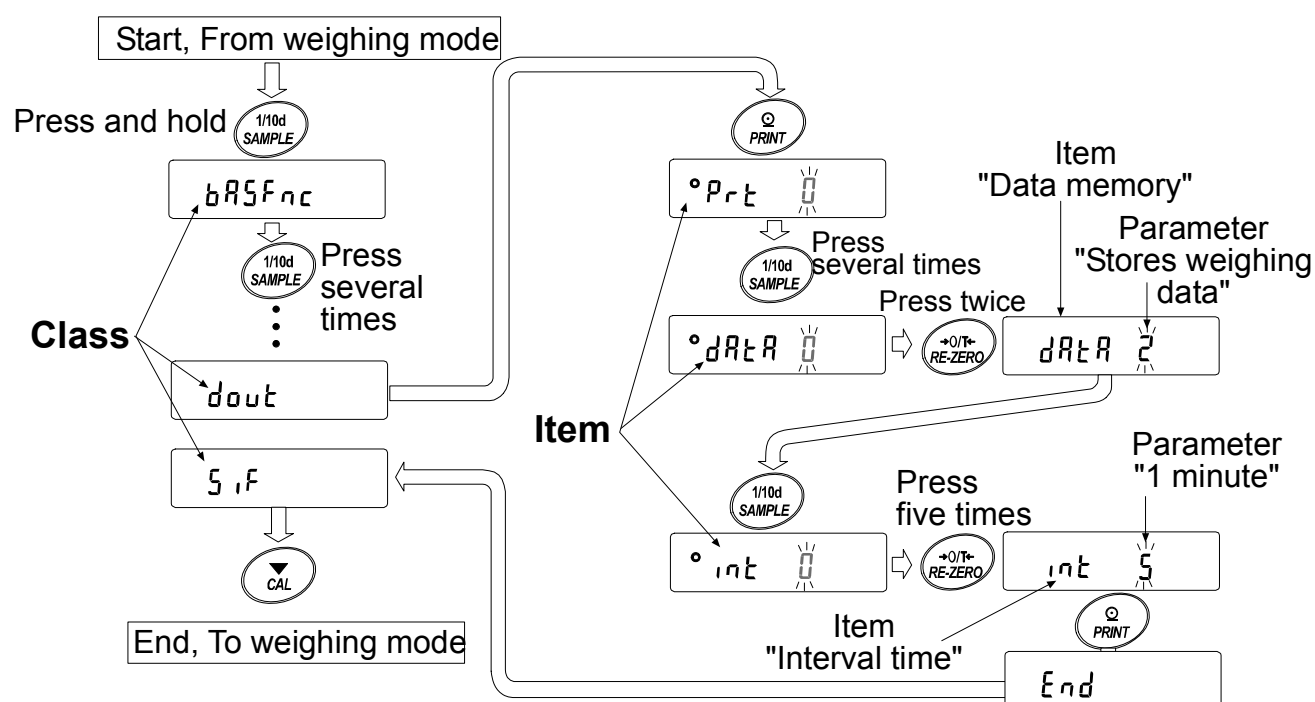
The function table reads or rewrites the parameters that are stored in the balance. These parameters are maintained in non-volatile memory, even if the AC adapter is removed.

10-1 Structure and Sequence of the Function Table

The function table menu consists of two layers. The first layer is the “Class” and the second layer is the “Item”. Each item stores a parameter.

Example

This example sets “Stores weighing data” for “Data memory” and “1 minute” for “Interval time”.



10-2 Display and Keys

Display/Key	Description
°	The symbol “°” indicates that the parameter displayed is in effect.
1/10d SAMPLE	When pressed and held in the weighing mode, enters the function table mode. Selects the class or item in the function table mode.
→0/T← RE-ZERO	Changes the parameter.
PRINT	When a class is displayed, moves to an item in the class. When an item is displayed, stores the new parameter and displays the next class.
CAL	When an item is displayed, cancels the new parameter and displays the next class. When a class is displayed, exits the function table mode and returns to the weighing mode.

10-3 Details of the Function Table

Class	Item and Parameter		Description	
bR5Fnc Environment Display	Cond Condition	0	Fast weighing speed, sensitive value	FAST
		1		MID
		2	Slow weighing speed, stable value	SLOW
	St-b Stability band width	0	Stable range is ± 1 digit	
		1		
		2	Stable range is ± 3 digits	
	Hold *1 Hold function	0	OFF	
		1	ON	Holds the display when stable in animal mode. With "Hold 1", ANIMAL turns on.
	trc Zero tracking	0	OFF	
		1	Normal	Keeps zero display by tracking zero drift.
		2	Strong	3: AD-4212B-23
		3	Very strong	1: Other models
	SPd Display refresh rate	0	5 times/second	
		1	10 times/second	Period to refresh the display 0: AD-4212B-23 1: Other models
	Pnt Decimal point	0	Point (.)	
		1	Comma (,)	Decimal point format
	P-on Auto display-ON	0	OFF	
		1	ON	Turns on the weighing mode display when the AC adapter is plugged in.
	POFF *1 Auto display-OFF	0	OFF	
		1	ON (10 minutes)	Turns off the display after 10 minutes of inactivity.
	CSI Capacity indicator	0	OFF	
		1	ON	Capacity indicator Zero: 0%, Maximum capacity: 100%
	rn0 Minimum weighing value display at start	0	Displays the minimum weighing value	
		1	Does not display the minimum weighing value	Factory setting 1: AD-4212B-23/101/102 0: Other models
		2	Retains the previous condition	
	P-tr Tare at start	0	Does not tare (Displays the previous value)	
		1	Tares (Displays zero)	When setting to P-tr 0, do not perform the RE-ZERO operation frequently.
CL Add Clock	Refer to "10-9 Clock and Calendar Function".			The time and date are added to the output data.

■ Factory setting

Note: "Digit" is a unit of minimum weighing value

*1 Only the AD-4212A series balance displays this item.

Class	Item and Parameter		Description	
\overline{CP}_{out} Comparator output	$\overline{CP}-t$ Comparator output setting	■ $\overline{0}$	3-level comparator contact output	Only the AD-4212B series balance displays this class and item.
		$\overline{1}$	5-level comparator contact output	
\overline{CP}_{Func} Comparator	\overline{CP} Comparator mode	■ $\overline{0}$	No comparison	$\overline{0}$: AD-4212B-23 $\overline{1}$: Other models
		■ $\overline{1}$	Comparison, excluding “near zero” when stable or overloaded	
		$\overline{2}$	Comparison, including “near zero” when stable or overloaded	
		$\overline{3}$	Continuous comparison, excluding “near zero”	
		$\overline{4}$	Continuous comparison, including “near zero”	
	$\overline{CP}-r$ *2 Comparison results	■ $\overline{0}$	Not added	Use in A&D standard format.
		$\overline{1}$	Added	
	$bEP-$ LL buzzer	■ $\overline{0}$	OFF	Displayed only when 5-level comparator output (*3) is selected.
		$\overline{1}$	ON	
	$bEP-$ LO buzzer	■ $\overline{0}$	OFF	
		$\overline{1}$	ON	
	$bEP-$ OK buzzer	■ $\overline{0}$	OFF	
		$\overline{1}$	ON	
	bEP HI buzzer	■ $\overline{0}$	OFF	
		$\overline{1}$	ON	
	bEP HH buzzer	■ $\overline{0}$	OFF	Displayed only when 5-level comparator output (*3) is selected.
		$\overline{1}$	ON	
\overline{CP}_{HH} Secondary upper limit			Refer to "10-10 Comparator Function".	Displays \overline{CP}_{HH} , \overline{CP}_{LL} only when 5-level comparator output (*3) is selected.
\overline{CP}_{HI} Upper limit				
\overline{CP}_{LO} Lower limit				
\overline{CP}_{LL} Secondary lower limit				
$dout$ Data output (Not displayed when BCD output (OP-01) is installed.)	Prt Data output mode	■ $\overline{0}$	Key mode (when stable)	Accepts the PRINT key or external contact input to output (or store) data only when the display is stable.
		$\overline{1}$	Auto print mode A (Reference = zero)	Outputs (or stores) data when the display is stable and conditions of $RP-P$, $RP-b$ and the reference value are met.
		$\overline{2}$	Auto print mode B (Reference = last stable value)	
		$\overline{3}$	Stream mode / Interval memory mode	With $dRtR$ $\overline{0}$, outputs data continuously; with $dRtR$ $\overline{2}$, uses interval memory.
		$\overline{4}$	Key mode B (instantly)	Accepts the PRINT key or external contact input to output (or store) data, regardless of the display condition.
		$\overline{5}$	Key mode C (when stable)	Accepts the PRINT key or external contact input to output (or store) data, instantly when stable or after the display is stabilized.

■ Factory setting

*2 This item is not displayed for the AD-4212B series balance or when BCD output (OP-01) is installed.

*3 AD-4212A series balance: when OP-04 is installed
AD-4212B series balance: when " $\overline{CP}-t$ " is set to " $\overline{1}$ "

Class	Item and Parameter		Description	
<i>dout</i> Data output (Not displayed when BCD output (OP-01) is installed.)	<i>RP-P</i> Auto print polarity	▪ 0	Plus only	Displayed value>Reference
		1	Minus only	Displayed value<Reference
		2	Both	Regardless of displayed value
	<i>RP-b</i> Auto print difference	0	10 digits	Difference between reference value and displayed value
		▪ 1	100 digits	
		2	1000 digits	
	<i>dRA</i> Data memory	▪ 0	Not used	Related items: <i>Prt</i> , <i>int</i> , <i>d-no</i> , <i>S-t d</i> , <i>inFo</i>
		1	Stores unit mass in counting mode	
		2	Stores weighing data	
		3	Stores calibration data	
		4	Stores upper/lower limit values	
	<i>int</i> Interval time	▪ 0	Every measurement	Interval time in the interval memory mode when using <i>Prt</i> 3, <i>dRA</i> 2
		1	2 seconds	
		2	5 seconds	
		3	10 seconds	
		4	30 seconds	
		5	1 minute	
		6	2 minutes	
		7	5 minutes	
		8	10 minutes	
	<i>d-no</i> Data number output	▪ 0	No output	Refer to "14. DATA MEMORY".
		1	Output	
	<i>S-t d</i> Time/Date output	▪ 0	No output	Selects whether or not the time or date is added to the weighing data. For details, refer to "10-9 Clock and Calendar Function".
		1	Time only	
		2	Date only	
		3	Time and date	
	<i>S-id</i> ID number output	▪ 0	No output	Selects whether or not the ID number is output.
		1	Output	
	<i>PUSE</i> Data output pause	▪ 0	No pause	Selects the data output interval.
		1	Pause (1.6 seconds)	
	<i>RF-F</i> Auto feed	▪ 0	Not used	Selects whether or not automatic feed is performed.
		1	Used	
	<i>inFo</i> GLP output	▪ 0	No output	Selects GLP output method. For how to set time and date to be added, refer to "10-9 Clock and Calendar Function".
		1	AD-8121 format	
		2	General data format	
	<i>Rr-d</i> Zero after output	▪ 0	Not used	Adjusts zero automatically after data is output.
		1	Used	

▪ Factory setting

Note: "Digit" is a unit of minimum weighing value

Class	Item and Parameter		Description	
S i F Serial interface (Not displayed when BCD output (OP-01) is installed.)	b P S Baud rate	0	600 bps	
		1	1200 bps	
		▪ 2	2400 bps	
		3	4800 bps	
		4	9600 bps	
		5	19200 bps	
	b t P r Data bit, parity bit	▪ 0	7 bits, even	
		1	7 bits, odd	
		2	8 bits, none	
	t r L F Terminator	▪ 0	CR LF	CR: ASCII code 0Dh LF: ASCII code 0Ah
		1	CR	
	t Y P E Data format	▪ 0	A&D standard format	Refer to "10-6 Description of Item "Data Format".
		1	DP format	
		2	KF format	
		3	MT format	
		4	NU format	
5		CSV format		
t - U P Timeout	0	No limit	Selects the wait time to receive a command.	
	▪ 1	1 second		
t r C d AK, Error code	▪ 0	No output	AK: ASCII code 06h	
	1	Output		
t t S CTS, RTS control	▪ 0	Not used	Controls CTS and RTS.	
	1	Used		
b c d (Displayed only when BCD output (OP-01) is installed.)	d A t P Data	0	OFF at 1	ON at 0
		▪ 1	ON at 1	OFF at 0
	P o L P Polarity	▪ 0	OFF at negative	ON at positive or zero
		1	ON at negative	OFF at positive or zero
	S t b P Stability	0	OFF at stabilization indicator ON	ON at stabilization indicator OFF
		▪ 1	ON at stabilization indicator ON	OFF at stabilization indicator OFF
	O E r P OVER	0	OFF at E, -E display	
		▪ 1	ON at E, -E display	
	S t r P STROBE	0	Data refresh completed when ON→OFF	
		▪ 1	Data refresh completed when OFF→ON	
S t A P Status	0	OFF when weighing	ON when not weighing *4	
	▪ 1	ON when weighing	OFF when not weighing *4	
U n i t Unit			Refer to “5. WEIGHING UNITS”.	
i d ID number setting			Refer to “11. ID NUMBER AND GLP REPORT”.	
E r F n c Extended functions			Available only for the AD-4212A series balance when “To use the extended functions” is selected for the function switch and is used for special applications. For details, refer to “20. EXTENDED FUNCTIONS”.	

▪ Factory setting

*4 "Not weighing" is a condition that a weight value is not displayed such as re-zero operation or display-off state.

Caution

The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date or ID number.

10-4 Description of the Class “Environment, Display”

Condition (*Cond*)

Cond 0



Cond 2

This parameter is for sensitive response to the fluctuation of a weight value. Used when fast weighing speed is required. After setting, the balance displays **FAST**.

This parameter is for stable weighing with slow response. Used to prevent a weight value drift due to vibration or drafts. After setting, the balance displays **SLOW**.

Note

For the AD-4212A series balance, with “Hold function (*Hold*)” set to “ON (1)”, this item is used to set the averaging time.

Stability band width (*St-b*)

This item controls the width to regard a weight value as a stable value. When the fluctuation per second is less than the parameter, the balance displays the stabilization indicator and outputs or stores the data. The parameter influences the “Auto print mode”

St-b 0



St-b 2

This parameter is for sensitive response of the stabilization indicator. Used for exact weighing.

This parameter ignores slight fluctuations of a weight value. Used to prevent a weight value from drifting due to vibration or drafts.

Note

For the AD-4212A series balance, with “Hold function (*Hold*)” set to “ON (1)”, this item is used to set the stabilization range..

Hold function (*Hold*) (Animal weighing mode, AD-4212A only)

This function is used to weigh a moving object such as an animal.

When the weight value is over the weighing range from zero and the display fluctuation is within the stabilization range for a fixed period of averaging time, the processing indicator illuminates and the balance displays the average weight of the animal. When the animal is removed from the weighing pan, the display returns to zero automatically.

This function is available only when the hold function parameter is set to “1” (the animal mode indicator **ANIMAL** illuminates) and any weighing unit other than the counting mode is selected.

The averaging time and stabilization range are set in “Condition (*Cond*)” and “Stability band width (*St-b*)”.

Weighing range	Averaging time			Stabilization range	
0.2 g or over	<i>Cond 0</i>	2 seconds	Faster	<i>St-b 0</i>	Small
	<i>Cond 1</i>	4 seconds		<i>St-b 1</i>	
	<i>Cond 2</i>	8 seconds	More accurate	<i>St-b 2</i>	Big

Zero tracking (t_{rc})

This function tracks zero point drift caused by changes in the environment and stabilizes the zero point. Three levels of zero tracking are available. When the weight value is only a few digits, turn the function off for accurate weighing.

Note

Digit, when used for the AD-4212A/B series balance, indicates the minimum displayable weighing value.

$t_{rc} \ 0$	The tracking function is not used. Used for weighing a very light sample.
$t_{rc} \ 1$	The tracking function is used. Normal zero tracking.
$t_{rc} \ 2$	The tracking function is used. Strong zero tracking.
$t_{rc} \ 3$	The tracking function is used. Very strong zero tracking

Display refresh rate (SPd)

Frequency to refresh the display. This parameter influences "BCD output", "Comparator contact output" and "Stream mode".

Note

The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date or ID number.

Decimal point (P_{nt})

The decimal point format can be selected.

Auto display-ON (P_{on})

When the AC adapter is plugged in, the display is automatically turned on without the ON:OFF key operation, to display the weighing mode. Used when the balance is built into an automated system. A warm up for the appropriate duration is necessary for accurate weighing.

Auto display-OFF (P_{off}) (AD-4212A only)

When the AC adapter is connected and no operation is performed (inactivity state) for 10 minutes, the display is automatically turned off and the standby indicator is illuminated.

Capacity indicator (CS ,)

In the weighing mode, the indicator displays the weighing data relative to the weighing capacity in percentage. (Zero = 0%, maximum capacity = 100%)

When the "Data memory ($DATA$)" parameter is set to parameters other than "0" (not used), the indicator displays the information stored in memory, such as the amount of memory data or data number.

Minimum weighing value display at start (rnL)

When weighing is started, the digit of the minimum weighing value can be turned off without any key operation. ($rnL \ 1$)

Weighing can be started with the minimum weighing value of the previous measurement displayed. ($rnL \ 2$)

Tare at start ($P\text{-}t_r$)

When a hopper is attached to the weighing pan and loss-in weighing is performed, the remaining amount of the material will become unknown if tare is performed each time a weighing starts.

When " $P\text{-}t_r \ 0$ " is selected, tare is not performed at weighing start. So, the remaining amount of the material can be monitored when the power is turned on. When setting to $P\text{-}t_r \ 0$, do not perform the RE-ZERO operation frequently.

10-5 Description of the Item "Data output mode"

The parameter setting of the "Data output mode (Prt)" applies to the performance when the "Data memory ($dRtR$)" parameter is set to "2" (to store the weighing data) and when the data is transmitted using the RS-232C interface.

Notes

- Data output to the RS-232C is not available when the BCD output (OP-01) is installed.
- BCD output is refreshed at the display refresh rate.

Key mode

When the PRINT key is pressed or the external PRINT contact input is used, with the stabilization indicator on, the balance outputs or stores the weighing data and the display blinks one time.

Required setting	$dout$	$Prt \ 0$	Key mode
------------------	--------	-----------	----------

Auto print modes A and B

When the displayed value is stable and the conditions of "Auto print polarity", "Auto print difference" and reference value are met, the balance outputs or stores the weighing data.

When the PRINT key is pressed with the stabilization indicator on, the balance outputs or stores the data and the display blinks one time.

Mode A: Required setting	$dout$	$Prt \ 1$	Auto print mode A (reference = zero)
	$dout$	$RP-P$	Auto print polarity
	$dout$	$RP-b$	Auto print difference
Example	"With " $Rr-d \ 1$ " (to adjust zero after data is output), for weighing the added sample each time a sample is added."		
Mode B: Required setting	$dout$	$Prt \ 2$	Auto print mode B (reference = last stable value)
	$dout$	$RP-P$	Auto print polarity
	$dout$	$RP-b$	Auto print difference
Example	"For weighing while a sample is added."		

Stream mode

The balance outputs the weighing data continuously regardless of the display condition. The display does not blink in this mode. This mode is not available and the interval memory mode is used when the "Data memory ($dRtR$)" parameter is set to "2" (to store the weighing data).

Required setting	$dout$	$Prt \ 3$	Stream mode
	$dout$	$dRtR \ 0$	Data memory function is not used.
	$bRSFnc$	SPd	Display refresh rate
	S_{IF}	bPS	Baud rate
Example	"For monitoring data on a computer"		

Caution

The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date or ID number.

Key mode B

When the **PRINT** key is pressed or the external PRINT contact input is used, the balance outputs or stores the weighing data immediately regardless of the display condition. At this time, the display does not blink.

Key mode C

When the **PRINT** key is pressed or the external PRINT contact input is used, with the stabilization indicator on, the balance outputs or stores the weighing data immediately. If the stabilization indicator is not on, the balance waits for the indicator to turn on, and then outputs the weighing data. At this time, the display blinks one time.

Interval memory mode

The weighing data is periodically stored in memory.

Required setting	<i>dout</i>	<i>Pr t 3</i>	Interval memory mode
	<i>dout</i>	<i>dAt t 2</i>	Data memory function is used.
			Stores weighing data.
	<i>dout</i>	<i>int</i>	Interval time
Optional setting	<i>dout</i>	<i>S-t d 1, 2, or 3</i>	Adds the time and date.
Example	“For periodical weighing without a computer command and to output all of the data, to a computer, at one time”		

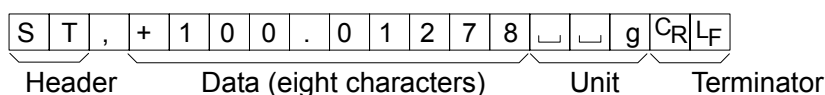
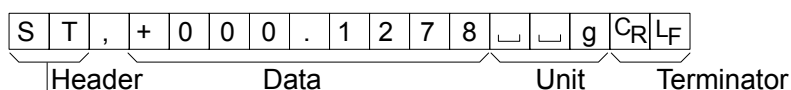
10-6 Description of the Item “Data format”

A&D standard format *S IF TYPE 0*

This format is used when the peripheral equipment can receive the A&D format.

If an AD-8121B is used, set the printer to MODE 1 or 2.

- This format consists of fifteen or sixteen characters excluding the terminator.
When numerical characters excluding a decimal point are exceeded eight characters for AD-4212B-23/102, the format becomes sixteen characters.
- A header of two characters indicates the balance condition.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is applied.
- The unit, consisting of three characters, follows the data.
- When comparison results are to be added (*CP Fnc CP-r 1*), the results appear between the header and the data.

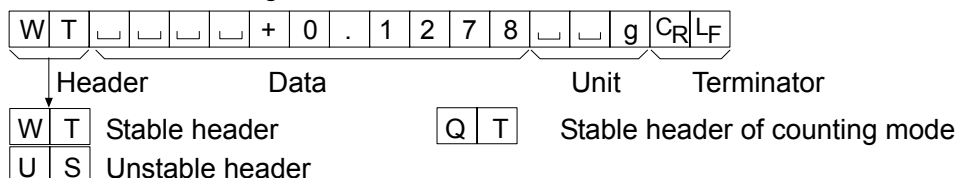


DP (Dump print) format *5 IF TYPE 1*

This format is used when the peripheral equipment can not receive the A&D format.

If an AD-8121B is used, set the printer to MODE 3.

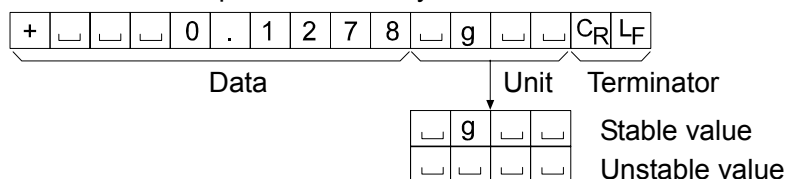
- This format consists of sixteen characters excluding the terminator.
- A header of two characters indicates the balance condition. No overload header is used.
- The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
- The unit, consisting of three characters, follows the data.



KF format *5 IF TYPE 2*

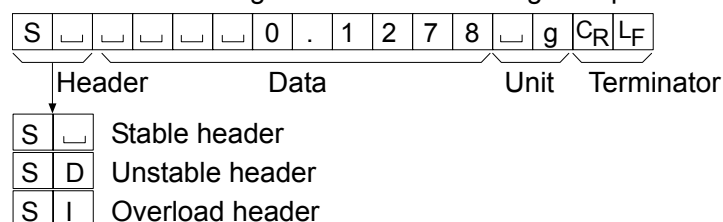
This is the Karl-Fischer moisture meter format and is used when the peripheral equipment can only communicate using this format.

- This format consists of fourteen characters excluding the terminator.
- This format has no header characters.
- The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
- This format outputs the unit only for a stable value.



MT format *5 IF TYPE 3*

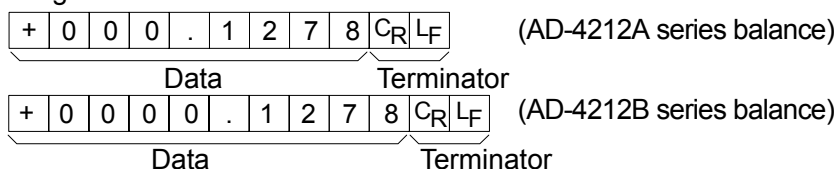
- A header of two characters indicates the balance condition.
- The polarity sign is used only for negative data.
- The weighing data uses spaces in place of the leading zeros.
- The character length of this format changes dependent upon the unit



NU (numerical) format *5 IF TYPE 4*

This format outputs only numerical data.

- This format consists of nine characters for the AD-4212A series balance or ten characters for the AD-4212B series balance, excluding the terminator.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.



CSV format 5,IF TYPE 5

- This format separates the data of A&D standard format and the unit by a comma (,).
- This format outputs the unit even when the data is overloaded.
- When a comma (,) is selected for decimal point, separators are set to semicolon (;).
- When the ID number, data number, time and date are added at "Data output (*dout*)" of the function table, outputs ID number, data number, date, time and weighing data in this order and separates each item by a comma and treats all the items as one group of data.

LAB-0123, No,012, 2004/07/01, 12:34:56, ST,+000.1278, _ _ g <CR><LF>

ID number Data number Date Time Weighing data

S	T	,	+	0	0	0	.	1	2	7	8	,	<u> </u>	<u> </u>	g	C _R	L _F			
O	L	,	+	9	9	9	9	9	9	9	E	+	1	9	,	<u> </u>	<u> </u>	g	C _R	L _F

10-7 Description of the Data Format Added to the Weighing Data

ID number *dout 5-id 1*

The number to identify a specific balance.

- This format consists of eight characters excluding the terminator.

L	A	B	-	0	1	2	3	C _R	L _F
---	---	---	---	---	---	---	---	----------------	----------------

Data number *dout d-no 1*

This format outputs the data number just before the data is transmitted using the RS-232C interface.

- This format consists of six characters excluding the terminator.
- When CSV format (5,IF TYPE 5) is selected, the period (.) is replaced with a comma (,).

N	o	.	0	0	1	C _R	L _F
Data number						Terminator	

Date *dout 5-td 2 or 3*

- The date output order can be changed in " Time/Date output (5-td)" and "Clock (CL Add)".
- The year is output in a four-digit format.

2	0	0	4	/	0	7	/	0	1	C _R	L _F
---	---	---	---	---	---	---	---	---	---	----------------	----------------

Time *dout 5-td 1 or 3*

- This format outputs time in 24-hour format.

1	2	:	3	4	:	5	6	C _R	L _F
---	---	---	---	---	---	---	---	----------------	----------------

10-8 Data Format Examples

Stable

° 0.1278 g

A&D	S	T	,	+	0	0	0	.	1	2	7	8			g	C _R	L _F		
DP	W	T						+	0	.	1	2	7	8			g	C _R	L _F
KF	+				0	.	1	2	7	8			g			C _R	L _F		
MT	S						0	.	1	2	7	8			g		C _R	L _F	
NU	+	0	0	0	0	.	1	2	7	8	C _R	L _F							

Unstable

- 18.3690 g

A&D	U	S	,	-	0	1	8	.	3	6	9	0			g	C _R	L _F	
DP	U	S				-	1	8	.	3	6	9	0			g	C _R	L _F
KF	-				1	8	.	3	6	9	0					C _R	L _F	
MT	S	D			-	1	8	.	3	6	9	0			g	C _R	L _F	
NU	-	0	0	1	8	.	3	6	9	0	C _R	L _F						

Overload

Positive error

E g

A&D	O	L	,	+	9	9	9	9	9	9	9	E	+	1	9	C _R	L _F	
DP												E					C _R	L _F
KF												H					C _R	L _F
MT	S	I	+															
NU	+	9	9	9	9	9	9	9	9	9	9	C _R	L _F					

Overload

Negative error

-E g

A&D	O	L	,	-	9	9	9	9	9	9	9	E	+	1	9	C _R	L _F	
DP									-	E							C _R	L _F
KF									L								C _R	L _F
MT	S	I	-		C _R	L _F												
NU	-	9	9	9	9	9	9	9	9	9	C _R	L _F						

_ Space, ASCII 20h
 C_R Carriage Return, ASCII 0Dh
 L_F Line Feed ASCII 0Ah

Units

		A&D	D.P.	KF	MT
g	g	g	g	g	g
mg	m g	m g	m g	m g	m g
Counting mode	P C	P C	P C	p c s	P C S
Precent mode	P c t	%	%	%	%
Ounce (Avoir)	o z	o z	o z	o z	o z
Troy Ounce	o z t	o z t	o z t	o z t	o z t
Metric Carat	c t	c t	c t	c t	c t
Momme	m m	m o m	m o m	m o m	m o
Pennyweight	d w t	d w t	d w t	d w t	d w t
Grain	G N	G N	G N	g r	G N
Tael (HK general, Singapore)	T L	t l	t l	t l s	t l
Tael (HK, jewelry)	T L	t l	t l	t l h	t l
Tael (Taiwan)	T L	t l	t l	t l t	t l
Tael (China)	T L	t l	t l	t l c	t l
Tola (India)	t	t	t	t o l	t
Messghal	M S	m e s	m e s	M S	m
Multi (AD-4212A only)	(Blank)				

_ Space, ASCII 20h

10-9 Clock and Calendar Function

The balance is equipped with a clock and calendar function. When the “GLP output (Info)” parameter is set to “1” or “2” and the “Time/Date output (Set)” parameter is set to “1”, “2” or “3”, the time and date are added to the output data. Set or confirm the time and date as follows:

Operation

- 1 Press and hold the **SAMPLE** key until **bASSEnc** of the function table is displayed, then release the key.
- 2 Press the **SAMPLE** key several times to display **CL Adj**.
- 3 Press the **PRINT** key. The balance enters the mode to confirm or set the time and date.

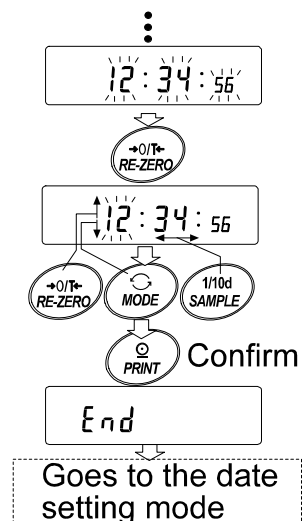
Confirming the time

- 4 The current time is displayed with all the digits blinking.
 - When the time is correct and the date does not need to be confirmed, press the **CAL** key and proceed to step 8.
 - When the time is correct and the date is to be confirmed, press the **SAMPLE** key and proceed to step 6.
 - When the time is not correct and is to be changed, press the **RE-ZERO** key and proceed to step 5.

Setting the time (with part of the digits blinking)

- 5 Set the time in 24-hour format using the following keys.

SAMPLE key	To select the digits to change the value. The selected digits blink.
RE-ZERO key	To increase the value by one.
MODE key	To decrease the value by one.
PRINT key	To store the new setting, display End and go to step 6.
CAL key	To cancel the new setting and go to step 6.



Confirming the date

- 6 The current date is displayed with all the digits blinking.
 - To change the display order of year (y), month (m) and day (d), press the **MODE** key. The date is output in the order as specified.
 - When the date is correct and the operation is to be finished, press the **CAL** key and proceed to step 8.
 - When the time is to be confirmed again, press the **SAMPLE** key and go back to step 4.
 - When the date is not correct and is to be changed, press the **RE-ZERO** key and proceed to step 7.

y m d

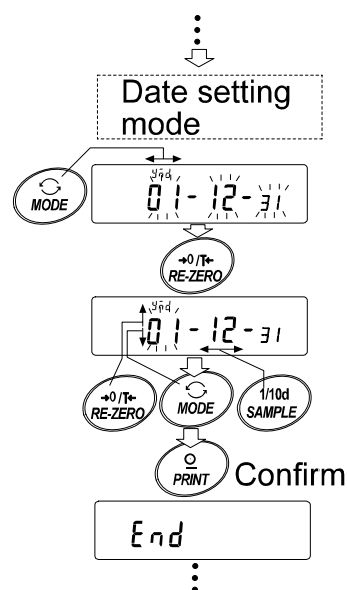
Note

The year is expressed using a two-digit format. For example, the year 2001 is expressed as "01".

Setting the date (with part of the digits blinking)

- 7 Set the date using the following keys.

SAMPLE key	To select the digits to change the value. The selected digits blink.
RE-ZERO key	To increase the value by one.
MODE key	To decrease the value by one.
PRINT key	To store the new setting, display End and go to step 8.
CAL key	To cancel the new setting and go to step 8.



Quitting the operation

- 8 The balance displays the next menu of the function table. Press the **CAL** key to exit the clock and calendar function and return to the weighing mode.

Notes

- Do not enter invalid values such as a non-existing date when setting the time and date.
- When the clock backup battery has been depleted, the balance displays **rtc PF**. Under this condition, press any key and set the time and date. The dead battery only affects the clock and calendar function. Even so, the function works normally as long as the AC adapter is connected to the balance.

10-10 Comparator Function

The balance outputs the results of the comparison in three or five levels.

AD-4212A series balance: 3-level output (standard) or 5-level output when OP-04 is installed.

AD-4212B series balance: 3-level or 5-level output, switched by "Comparator output setting ($\overline{CP-t}$)" of the function table.

The comparison results are indicated by \boxed{HI} \boxed{OK} \boxed{LO} on the display and are contact-output from the I/O unit.

The following five comparison conditions are available by "Comparator mode (\overline{CP})" of the function table $\overline{CP Fnc}$.

- No comparison
- Comparison when the weight value is stable or overloaded, excluding "near zero"
- Comparison when the weight value is stable or overloaded, including "near zero"
- Continuous comparison, excluding "near zero"
- Continuous comparison, including "near zero"

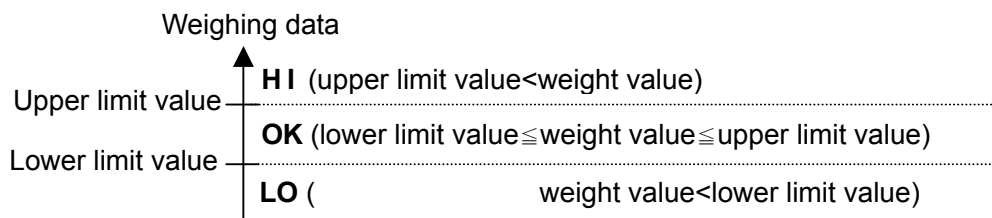
Note

"Near zero" indicates the amount of ten digits (digit = the minimum displayable weighing value).

The comparison is performed using the upper limit value and lower limit value.

The function table $\overline{CP Fnc}$ has one more item: "Buzzer (bEP)" to select whether or not to sound the buzzer depending on the results.

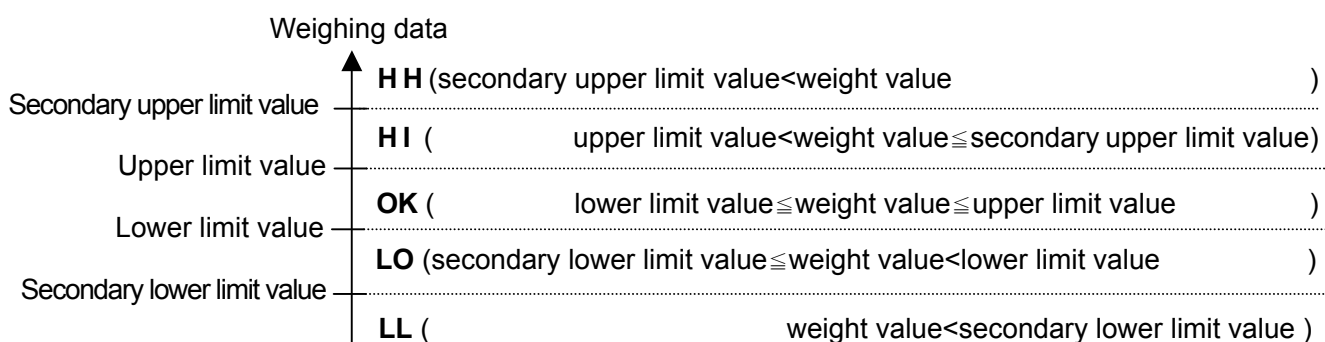
Three-level comparison results



Three-level comparison

Comparison results	Display	Contact output			Buzzer
		HI	OK	LO	
HI	\boxed{HI} illuminated	short	open	open	bEP^-
OK	\boxed{OK} illuminated	open	short	open	bEP^-
LO	\boxed{LO} illuminated	open	open	short	bEP_-

Five-level comparison results



Five-level comparison

Comparison results	Display	Contact output					Buzzer
		H H	HI	OK	LO	LL	
H H	HH blinking	short	open	open	open	open	EEP ⁺
HI	HI illuminated	open	short	open	open	open	EEP ⁺
OK	OK illuminated	open	open	short	open	open	EEP ⁻
LO	LO illuminated	open	open	open	short	open	EEP ⁻
LL	LL blinking	open	open	open	open	short	EEP ⁻

- * Set the upper limit value equal to or higher than the lower limit value.
Set the secondary upper limit value equal to or higher than the upper limit value.
Set the secondary lower limit value equal to or lower than the lower limit value.

Setting the upper/lower limit values

When five-level comparison is to be performed, using the AD-4212B series balance, set the "Comparator output setting (EEP⁻)" parameter to "I".

- 1 Press and hold the SAMPLE key until PASS Fnc of the function table is displayed, then release the key.
- 2 Press the SAMPLE key several times to display the value name to be set.

EEP HH secondary upper limit value

EEP HI upper limit value

EEP LO lower limit value

EEP LL secondary lower limit value

- 3 Press the PRINT key. The value currently set is displayed with all of the digits blinking.
- 4 When the current setting is not to be changed, press the PRINT or CAL key to proceed to step 5.

When the current setting is to be changed, press the RE-ZERO key. Change the setting using the following keys.

- | | |
|---|---|
| SAMPLE key | To select the digit to change the value. |
| RE-ZERO key | To change the value of the digit selected. |
| MODE key | To switch the polarity. |
| PRINT key | To store the new setting and go to step 5. |
| CAL key | To cancel the new setting and go to step 5. |

- 5 Repeat steps 2-4 to set values as necessary.

Note

The upper/lower limit values can be set by external commands using the RS-232C serial interface.

Command example

H H :+100.00000 g (to set secondary upper limit value)

H I :+080.00000 g (to set upper limit value)

L O :+060.00000 g (to set lower limit value)

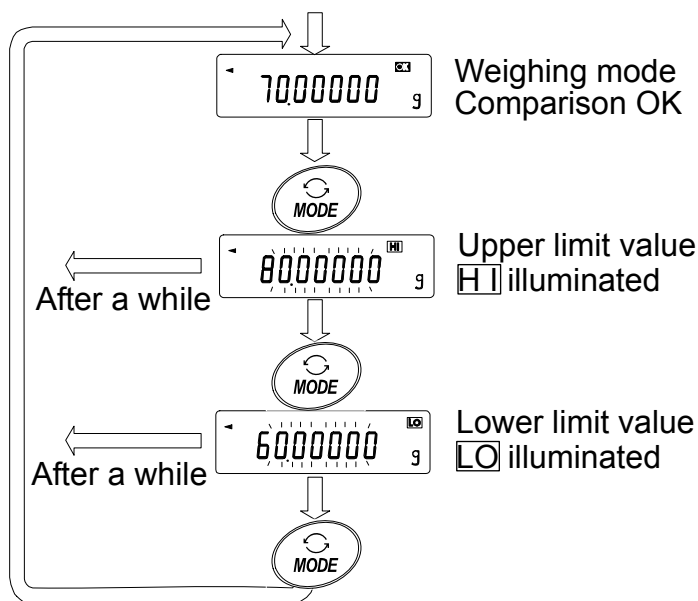
L L :+040.00000 g (to set secondary lower limit value)

 indicates a space (20h)

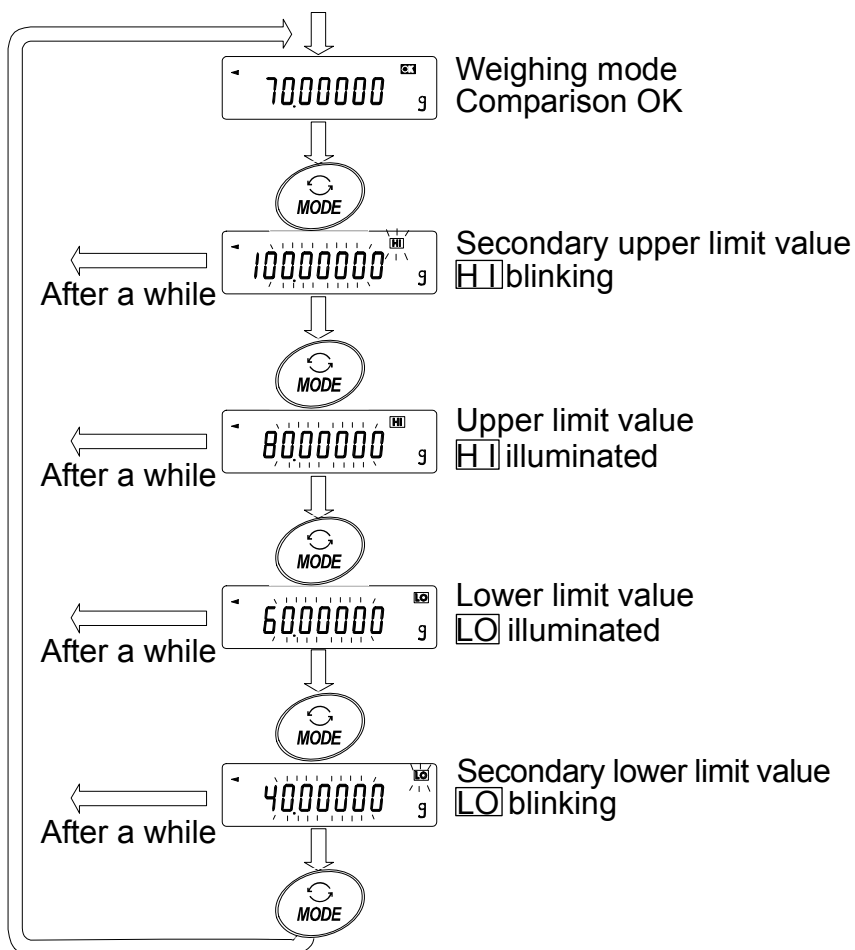
Confirming the upper/lower limit values

To confirm the upper/lower limit values during weighing operation, press the **MODE** key. The upper/lower limit values will be displayed. Even under this condition, weighing operation goes on and data output, contact output of the comparison results and **RE-ZERO** can be performed.

When three-level comparison is selected



When five-level comparison is selected



Note

The upper/lower limit values can be confirmed by external commands using the RS-232C serial interface.

e.g., Command	?HH	(to confirm secondary upper limit value)
Response	HH, +100.00000 ▯ ▯g	(secondary upper limit value=100.00000 g)
Command	?HI	(to confirm upper limit value)
Response	HI +080.00000 ▯ ▯g	(upper limit value=80.00000 g)
Command	?LO	(to confirm lower limit value)
Response	LO, +060.00000 ▯ ▯g	(lower limit value=60.00000 g)
Command	?LL	(to confirm secondary lower limit value)
Response	LL, +040.00000 ▯ ▯g	(secondary lower limit value=40.00000 g)

▯ indicates a space (20h)

Adding the comparison results (AD-4212A only)

To add the comparison results to the output data, set “Comparison results ($\overline{CP-r}$)” parameter of the function table to “1”.

ST, HH, 110.0000 ▯ ▯ g	HH (Only when OP-04 is installed.)
ST, HI, +090.0000 ▯ ▯ g	HI
ST, OK, +070.0000 ▯ ▯ g	OK
ST, LO, +050.0000 ▯ ▯ g	LO
ST, LL, +030.0000 ▯ ▯ g	LL (Only when OP-04 is installed.)
ST, - -, +000.0000 ▯ ▯ g	No comparison when unstable or near zero

▯ indicates a space (20h)

Notes

Select A&D standard format. Set “Data format (\overline{YPE})” parameter of the function table to “0”.

The comparison results can not be added to the weighing data stored in memory.

11. ID NUMBER AND GLP REPORT

- The ID number is used to identify the balance when Good Laboratory Practice (GLP) is used.
- The ID number is maintained in non-volatile memory even if the AC adapter is removed.
- The GLP output format is selected at “GLP output (*GLP*)” of the function table and can be output to a personal computer or printer using the RS-232C serial interface.
- The GLP output format includes the balance manufacturer, model, serial number, ID number, date, time and space for signature for weighing data, the weight used and results for calibration or calibration test data.
- The balance can output the following reports for GLP.
 - “Calibration report” of the calibration
 - “Calibration test report” of the calibration test
 - “Title block” and “End block” for the weighing data
- Calibration and calibration test data can be stored in memory to output several reports at the same time. Refer to “14. DATA MEMORY” for details.
- For details on confirming and setting the time and date, refer to “10-9 Clock and Calendar Function”.

11-1 Setting the ID Number

- 1 Press and hold the **[SAMPLE]** key until **[bRSFnC]** of the function table is displayed, then release the key.
- 2 Press the **[SAMPLE]** key several times to display **[id]**.
- 3 Press the **[PRINT]** key. Set the ID number using the following keys.
 - [SAMPLE]** key To select the digit to change the value.
 - [RE-ZERO]** key To set the character of the digit selected. Refer to the display character set shown below.
 - [PRINT]** key To store the new ID number and display **[bRSFnC]**.
 - [CAL]** key To cancel the new ID number and display **[bRSFnC]**.
- 4 With **[bRSFnC]** displayed, press the **[CAL]** key to return to the weighing mode.

Display character set

0	1	2	3	4	5	6	7	8	9	-	_	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
0	1	2	3	4	5	6	7	8	9	-	_	R	b	C	d	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

_ Space

11-2 GLP Report

Set the following parameters to output the report.

- To print the report, set the “GLP output (*info*)” parameter to “1” and use MODE 3 of the AD-8121B. For details on using the printer, refer to “17-1 Connection to the AD-8121B Printer”.
- To output the report to a personal computer using the RS-232C interface, set the “GLP output (*info*)” parameter to “2”.
- If the time and date are not correct, set the correct time and date in “Clock (*CL Adj*)” of the function table.

Note

For operational details about calibration and calibration test, refer to “8. CALIBRATION”.

Calibration report

When the setting is “*info 1*”:

AD-8121 format

```

      A & D
AD4212B-102
S/N      01234567
ID       ABCDEFG
DATE    2000/12/31
TIME     12:34:56
CALIBRATED(EXT.)
CAL.WEIGHT
+50.000000 9
SIGNATURE
-----

```

□ Space, ASCII 20h

<TERM> Terminator, C_R, L_F or C_R

C_R Carriage return, ASCII 0Dh

L_F Line feed, ASCII 0Ah

When the setting is “*info 2*”:

General data format

```

_____A_&_D<TERM>
_____AD4212B-102<TERM>
S/N_____01234567<TERM>
ID_____ABCDEFG<TERM>
DATE<TERM>
_____2000/12/31<TERM>
TIME<TERM>
_____12:34:56<TERM>
CALIBRATED(EXT.)<TERM>
CAL.WEIGHT
____+50.00000__g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
-----<TERM>
<TERM>
<TERM>

```

Calibration test report using an external weight

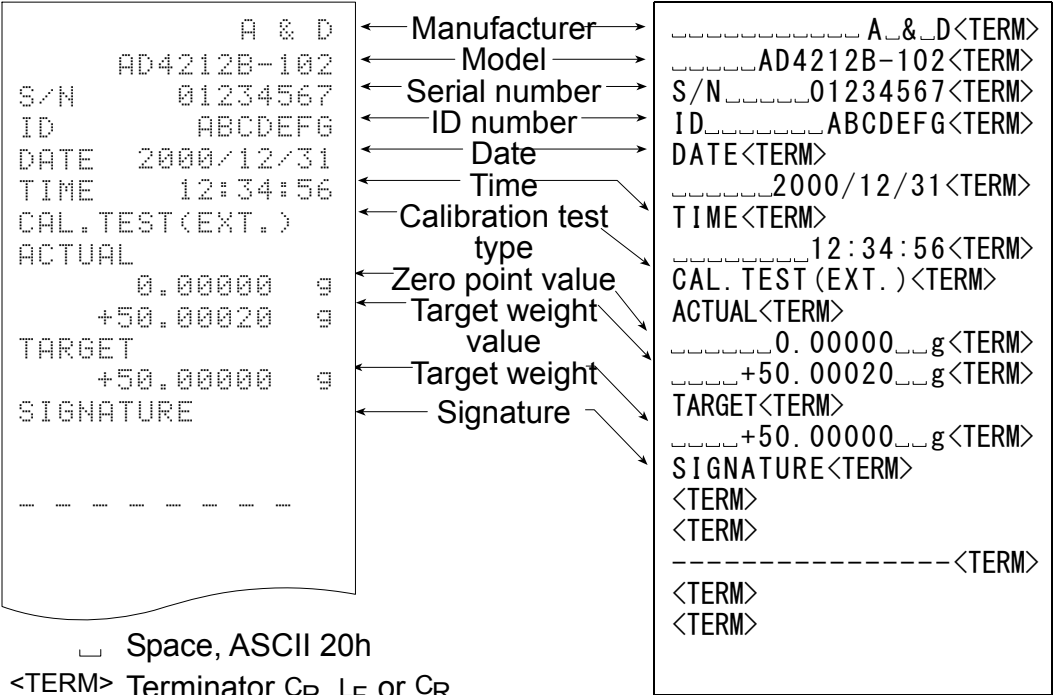
(Calibration test does not perform calibration.)

When the setting is “*info 1*”:

When the setting is “*info 2*”:

AD-8121 format

General data format



- Space, ASCII 20h
- <TERM> Terminator, CR, LF or CR
- CR Carriage return, ASCII 0Dh
- LF Line feed, ASCII 0Ah

Title block and end block

When weight values are recorded as GLP data, a “Title block” is inserted at the beginning and an “End block” is inserted at the end of a group of weight values in the GLP report.

Notes

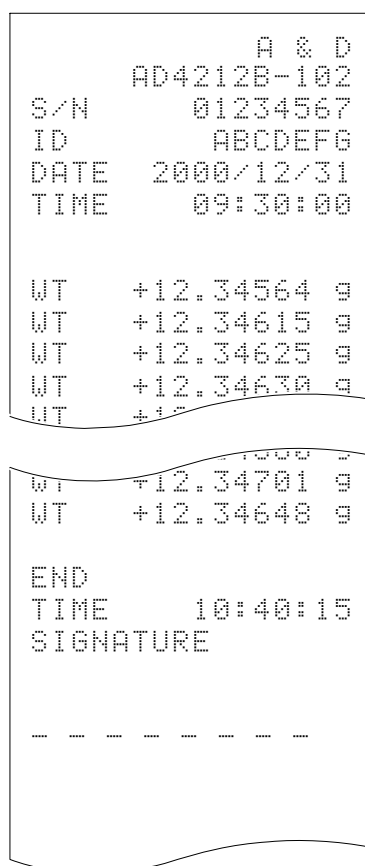
- To output the report to an AD-8121B , use **MODE 3** of the AD-8121B.
- If the data memory function is used, the “Title block” and “End block” can not be output.

Operation

- 1 With the weighing data displayed, press and hold the **PRINT** key until **Start** is displayed, then release the key. The “Title block” is output.
- 2 The weighing data is output according to the parameter setting of the data output mode.
- 3 Press and hold the **PRINT** key until **reEnd** is displayed, then release the key. The “End block” is output.

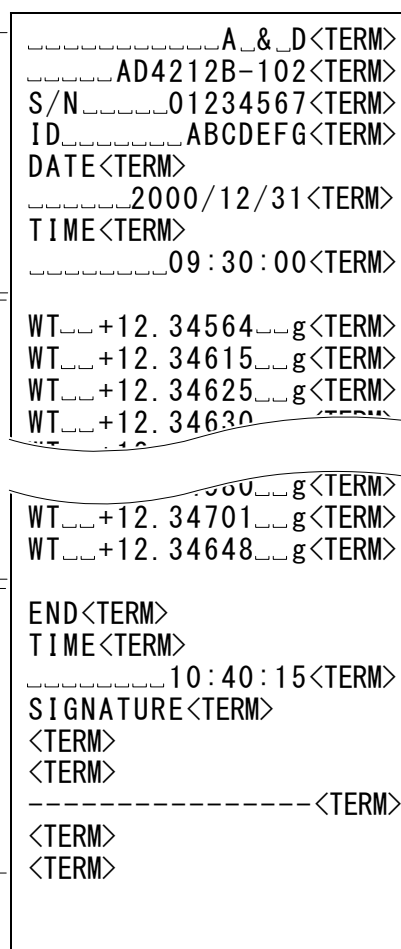
When the setting is “info 1”:

AD-8121 format



When the setting is “info 2”:

General data format



□ Space, ASCII 20h

<TERM> Terminator, C_R, L_F or C_R

C_R Carriage return, ASCII 0Dh

L_F Line feed, ASCII 0Ah

12. COUNTING MODE (PC)

This is the mode to determine the number of objects in a sample based on the standard sample unit mass. The unit mass is the mass of one piece of the sample. The smaller the variables in each sample unit mass are, the more accurate the counting will be. The AD-4212A/B series balance is equipped with the Automatic Counting Accuracy Improvement (ACAI) function to improve the counting accuracy.

Notes

- Use samples with a unit mass of 1 mg or more (AD-4212A-100, AD-4212B series) or 10 mg or more (AD-4212A-200/600/1000) for counting.
- If the sample unit mass variable is too large, it may cause a counting error.
- To improve the counting performance, use the ACAI function frequently or divide the samples into several groups and count each group.

Selecting the counting mode

- 1 Set "Unit selection (Unit)" parameter of the function table to PC (counting mode). For details, refer to "5-2 Changing the Unit".

Storing a sample unit mass

- 2 Press the **[SAMPLE]** key to enter the sample unit mass storing mode.
To return to the counting mode without storing the sample unit mass, press the **[CAL]** key.
- 3 To select the number of samples, press the **[SAMPLE]** key several times. It may be set to 10, 25, 50 or 100.

Note

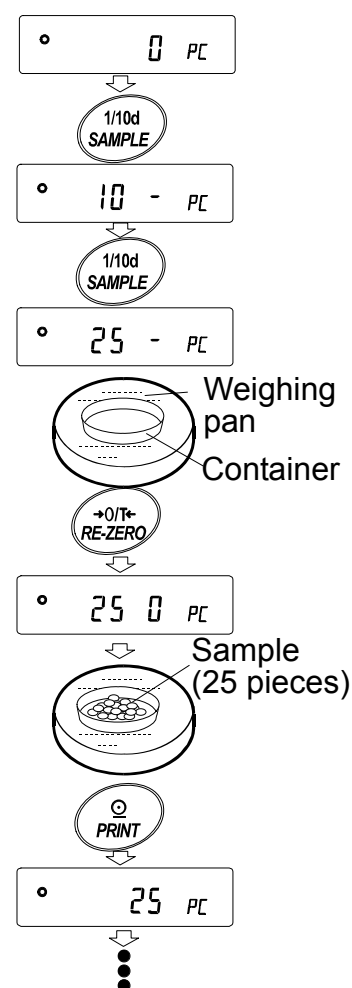
A greater number of samples will yield more accurate counting result.

- 4 Place a container on the weighing pan, if necessary. Press the **[RE-ZERO]** key to cancel the weight (tare). The number specified in step 3 appears.

e.g.: **[25.0 PC]** is displayed if 25 is selected in step 3.

- 5 Place the number of samples specified on the pan. In this example, 25 pieces.
- 6 Wait for the stabilization indicator to be displayed. Press the **[PRINT]** key to calculate and store the unit mass. The balance displays **[25 PC]** (counting mode) and is set to count samples with this unit mass. (The sample unit mass stored, even if the AC adapter is removed, is maintained in non-volatile memory.)

To improve the accuracy of the unit mass, proceed to step 8.



Notes

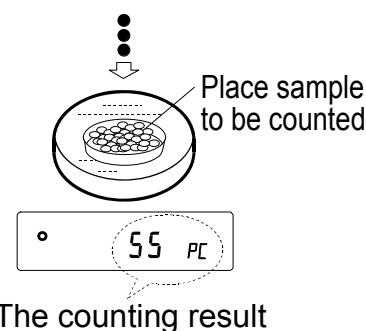
- If the balance judges that the mass of the samples is too light and is not adequate to be used as the unit mass, it displays **Lo**. In that case, store the mass by some quantity. For example, when the model with the minimum weighing value of 0.01 g is used and 10 pieces of samples weigh 0.05 g. Store 100 pieces of samples as 10 and multiply the weighing result by 10.
- If the balance judges that the mass of the samples is too light to acquire accurate weighing, it displays an error requiring the addition of more samples to the specified number. In the example above, **50-PC** appears, requiring 25 more samples. Add 25 samples and press the **PRINT** key. When the unit mass is stored correctly, the balance proceeds to the counting mode.

Counting operation

- 7 Place the samples to be counted on the pan.
While the stabilization indicator is on, pressing the **PRINT** key will output the weight value, using the RS-232C serial interface.

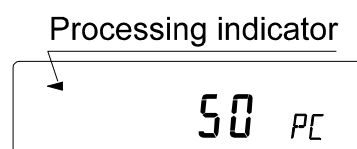
Note

Peripheral equipment, that is sold separately, such as a printer or a personal computer is required.



Counting mode using the ACAI function

The ACAI is a function that improves the accuracy of the unit mass automatically by increasing the number of samples and averaging the unit mass variable to minimize the weighing error, as the counting process proceeds.



- 8 If a few more samples are added, the processing indicator turns on. To prevent an error, add three or more. The processing indicator does not turn on if overloaded. Try to add the same number of samples as displayed.
- 9 The balance re-calculates the unit mass while the processing indicator is blinking. Do not touch the balance or samples on the pan until the processing indicator turns off.
- 10 Counting accuracy is improved when the processing indicator turns off.
Each time the above operation is performed, a more accurate unit mass will be obtained. There is no definite upper limit of ACAI range for the number of samples exceeding 100. Try to add the same number of samples as displayed.
- 11 Remove all the samples used in ACAI and proceed with the counting operation using the improved unit mass.

13. PERCENT MODE (Pct)

This is the mode to display the weight value in percentage compared to a 100% reference mass and is used for target weighing or checking the sample variable.

Selecting the percent mode

- 1 Set "Unit selection (Unit)" parameter of the function table to P_{ct} (percent mode). For details, refer to "5-2 Changing the Unit".

Storing the 100% reference mass

- 2 Press the **[SAMPLE]** key to enter the 100% reference mass storing mode. To return to the percent mode without storing the 100% reference mass, press the **[CAL]** key.
- 3 Place a container on the weighing pan, if necessary. Press the **[RE-ZERO]** key to cancel the weight (tare). The balance displays **100.0 Pct**.
- 4 Place the sample to be set as the 100% reference mass on the pan or in the container.
- 5 Wait for the stabilization indicator to be displayed. Press the **[PRINT]** key to store the reference mass. The balance displays **100.00 Pct**. (The reference mass stored, even if the AC adapter is removed, is maintained in non-volatile memory.)

Notes

- If the balance judges that the mass of the sample is too light to be used as a reference, it displays **[Lo]**. Do not use the sample.
 - The decimal point position depends on the 100% reference mass. (For details, refer to the below table*.)
- 6 Remove the sample.

Reading the percentage

- 7 Place a sample to be compared to the reference mass on the pan. The displayed percentage is based on the 100% reference mass. While the stabilization indicator is on, pressing the **[PRINT]** key will output the weight value, using the RS-232C serial interface.

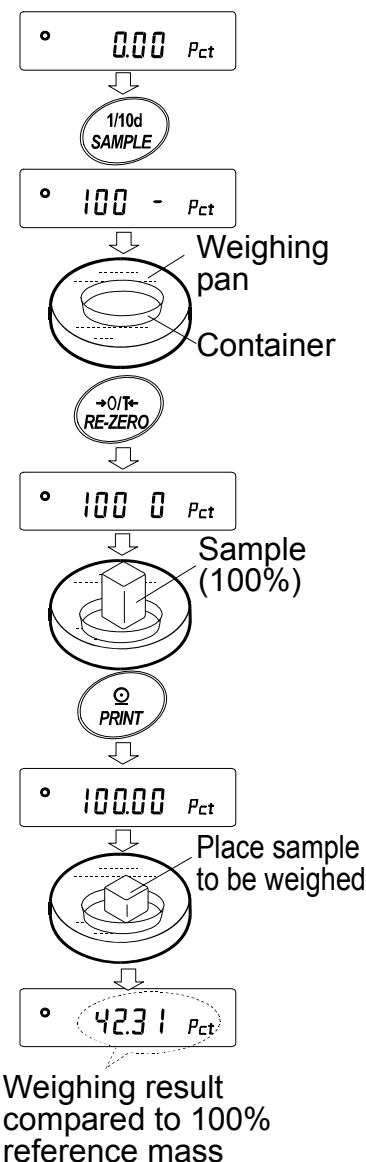
Note

Peripheral equipment, that is sold separately, such as a printer or a personal computer is required.

* Relations between decimal point position and 100% reference mass

Models (A series)	100% reference mass	Minimum weighing value
AD-4212A-100	0.0100g to 0.0999g	1%
	0.1000g to 0.9999g	0.1%
	1.0000g or greater	0.01%
AD-4212A-200 AD-4212A-600 AD-4212A-1000	0.100g to 0.999g	1%
	1.000g to 9.999g	0.1%
	10.000g or greater	0.01%

Models (B series)	100% reference mass	Minimum weighing value
AD-4212B-23	0.00100g to 0.00999g	1%
	0.01000g to 0.09999g	0.1%
	0.1000g or greater	0.01%
AD-4212B-101 AD-4212B-102 AD-4212B-201 AD-4212B-301	0.0100g to 0.0999g	1%
	0.1000g to 0.9999g	0.1%
	1.0000g or greater	0.01%
	10.000g or greater	0.01%



14. DATA MEMORY

Data memory is a function to store weighing data or calibration data to display or output later. The data memory function can also store multiple upper/lower limit values or unit mass values, for later selection as necessary.

One of the following data sets can be stored:

- Weighing data (Up to 200 sets. 100 sets when the time and date are added.)
- Calibration and calibration test data (latest 50 sets)
- Unit mass in the counting mode (Up to 20 sets)
- Upper/lower limit values (Up to 20 sets)

Note

Data memory function is not available when the BCD output (OP-01) is installed.

14-1 Notes on Using Data Memory

To use the memory function, set the "Data memory (*dAtA*)" parameter of the function table. In addition, for weighing data, set the "Time/Date output (*S-t d*)" parameter. For details on setting the data memory, refer to "10. FUNCTION TABLE".

For weighing data, the data contents to be stored and the storage capacity depend on the "Time/Date output (*S-t d*)" parameter setting.

Releasing "[Lr]"

If a different type of data exists in memory when the data is stored, "[Lr]" appears blinking in the upper left of the display. For example, you want to store weighing data but calibration data or unit mass data remains in memory.



Under such a condition, before storing data, delete the data in memory as follows:

- 1 Press and hold the **PRINT** key until **[Lr no]** with "no" blinking is displayed, then release the key.
- 2 Press the **RE-ZERO** key to display **[Lr 00]** with "00" blinking.

The type of data stored in memory appears on the upper left of the display as shown below:

Unit mass in the counting mode	<i>PC</i>
Weighing data without time and date	<i>-d-</i>
Weighing data with time and date	<i>d-t</i>
Calibration or calibration test data	<i>HIS</i>
Upper/lower limit values	<i>LP</i>

- 3 Press the **PRINT** key to delete all the data in memory.
- 4 The balance displays **[End]** and returns to the weighing mode.

14-2 Memory for Weighing Data

- The data memory function can store 200 sets of weighing data (100 set if time and date are added). Even if the AC adapter is removed, the data is maintained in non-volatile memory.
- It is not necessary that the printer or computer be continually connected to the balance, because the balance stores the weighing data in memory.
- The data in memory is available to be displayed on the balance for confirmation, or to output several sets of data at one time to a printer or personal computer. In the function table, what data is to be added to the output data (ID number, data number, time and date) can be selected.

Storing the weighing data

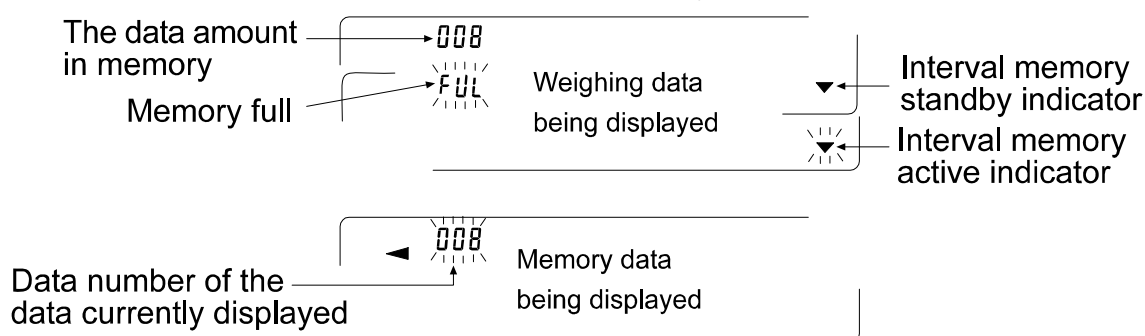
Note

If “**Err**” appears blinking in the upper left of the display, delete the data in memory.

- 1 Set the “Data memory (*data*)” parameter to “2”.
- 2 Set the “Time/Date output (*time*)” parameter as necessary.
- 3 The storing operation depends on the “Data output mode (*mode*)” parameter setting. Four types of operating modes are available to store data.

Key mode	Each time the PRINT key is pressed while the displayed value is stable, the balance stores the weighing data.
Auto print modes A and B	When the displayed value is stable and the conditions of “Auto print polarity”, “Auto print difference” and reference value are met, the balance stores the weighing data.
Interval memory mode	Weighing data is stored at an interval specified in “Interval time (<i>int</i>)”. Press the PRINT key to start and stop this mode.

(Display example: AD-4212A series balance)



Caution

- When weighing data is being stored in memory, the data output to a personal computer using the RS-232C interface is not available.
- “**FUL**” indicates that memory is full or the memory capacity has been reached. More data can not be stored unless the memory data is deleted.

- The following commands can not be used during data storage.

Q	Query command for weighing data.
S	Query command for stable weighing data.
SI	Query command for weighing data.
SIR	Query command for continuous weighing data.

Setting the function table

Parameter settings for each output mode are as follows:

Item Mode	Data output mode	Auto print polarity, difference	Data memory function	Interval time
Key mode	<i>Prt 0, 4, 5</i>	Not used	<i>dRtA 2</i>	Not used
Auto print mode A	<i>Prt 1</i>	<i>RP-A 0-2</i>	<i>dRtA 2</i>	
Auto print mode B	<i>Prt 2</i>	<i>RP-b 0-2</i>	<i>dRtA 2</i>	
Interval memory mode	<i>Prt 3</i>	Not used	<i>dRtA 2</i>	<i>int 0-8</i>

Set each item, depending on the situation, as follows:

Data number	No	<i>d-no 0</i>	Time and date	No	<i>S-td 0</i>
	Yes	<i>d-no 1</i>		Time only	<i>S-td 1</i>
ID number	No	<i>S-id 0</i>		Date only	<i>S-td 2</i>
	Yes	<i>S-id 1</i>		Both	<i>S-td 3</i>

With *S-td 1*, *S-td 2* or *S-td 3* selected, the amount of data to be stored is 100 sets.

Recalling the memory data

Confirm that the “Data memory (*dRtA*)” parameter is set to “2”.

- 1 Press and hold the **PRINT** key until **rECALL** is displayed, then release the key.
- 2 Press the **PRINT** key to enter the memory recall mode. Recall the data in memory using the following keys

RE-ZERO key	To proceed to the next data set.
MODE key	To go back to the previous data set.
PRINT key	To transmit the current data using the RS-232C interface.

With **SAMPLE** held down, press the **CAL** key
To delete the data currently displayed.

Note: Deleting the data will not increase the amount of data that can be stored.

CAL key To exit the memory recall mode.

- 3 Press the **CAL** key to return to the weighing mode.

Transmitting all memory data at one time

Confirm that the “Serial interface (S, P)” parameters are set properly. For details, refer to “10. FUNCTION TABLE” and “17. CONNECTION TO PERIPHERAL EQUIPMENT”.

- 1 Press and hold the **PRINT** key until **rEEALL** is displayed, then release the key.
- 2 Press the **SAMPLE** key to display **out**.
- 3 Press the **PRINT** key to display **out no** with “no” blinking.
- 5 Press the **RE-ZERO** key to display **out Go** with “Go” blinking.
- 6 Press the **PRINT** key to transmit all data using the RS-232C interface.
- 7 The balance displays **CLEAR** when all data is transmitted. Press the **CAL** key to return to the weighing mode.

Deleting all memory data at one time

- 1 Press and hold the **PRINT** key until **rEEALL** is displayed, then release the key.
- 2 Press the **SAMPLE** key several times to display **CLEAR**.
- 3 Press the **PRINT** key to display **Clr no** with “no” blinking.
- 4 Press the **RE-ZERO** key to display **Clr Go** with “Go” blinking.
- 5 Press the **PRINT** key to delete all data
- 6 The balance displays **End**, then **rEEALL** when all data is deleted.
- 7 Press the **CAL** key to return to the weighing mode.

14-3 Memory for Calibration and Calibration Test Data

- Calibration data (when and how it is performed) and calibration test data can be stored in memory.
- All the data in memory is available to be output at one time to a printer or personal computer.
- Up to 50 data sets of the latest calibration or calibration test can be stored. When the memory capacity has been reached, "FUL" illuminates.

Storing the calibration and calibration test data

Note

If "Err" appears blinking in the upper left of the display, delete the data in memory.

Store the calibration and calibration test data as follows:

- 1 Set the "Data memory (dAtA)" parameter to "3".
- 2 Set the "GLP output (nFo)" parameter to "1" or "2".
- 3 With the settings above, each time calibration or calibration test is performed, the data is stored automatically.

Transmitting the memory data

Confirm that the "Serial interface (SIF)" parameters are set properly. For details, refer to "10. FUNCTION TABLE" and "17. CONNECTION TO PERIPHERAL EQUIPMENT" and also confirm that the "Data memory (dAtA)" parameter is set to "3".

- 1 Press and hold the **PRINT** key until **out** is displayed, then release the key.
- 2 Press the **PRINT** key to display **out no** with "no" blinking.
- 3 Press the **RE-ZERO** key to display **out Go** with "Go" blinking.
- 4 Press the **PRINT** key to transmit all memory data using the RS-232C interface.
- 5 The balance displays **Clear** when all memory data is transmitted. Press the **CAL** key to return to the weighing mode.

Deleting the memory data

- 1 Press and hold the **PRINT** key until **out** is displayed, then release the key.
- 2 Press the **SAMPLE** key to display **Clear**.
- 3 Press the **PRINT** key to display **Err no** with "no" blinking.
- 4 Press the **RE-ZERO** key to display **Err Go** with "Go" blinking.
- 5 Press the **PRINT** key to delete all data
- 6 The balance displays **out** when all the data has been deleted. Press the **CAL** key to return to the weighing mode.

14-4 Memory for Unit Mass in the Counting Mode

- The data memory function can store 20 sets of unit mass for the counting mode. Even if the AC adapter is removed, the data is maintained in non-volatile memory. Among the 20 sets, “P01” is the memory function for the standard counting mode.
- The unit mass in memory can be recalled and used for weighing.
- The unit mass in memory can be recalled and changed.

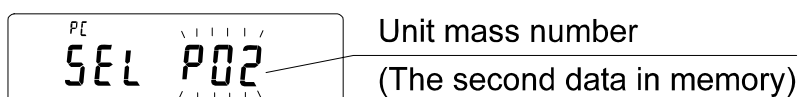
Recalling the unit mass

- 1 Set the “Data memory (*DATA*)” parameter to “1”.
- 2 Set “Unit selection (*UNIT*)” parameter of the function table to *PC* (counting mode). For details, refer to “5-2 Changing the Unit”.

Note

If “*Err*” appears blinking in the upper left of the display, delete the data in memory.

- 3 Press and hold the **PRINT** key until the balance enters the sample unit mass selection mode as shown below.



- 4 Select the unit mass to be used using the following keys.

RE-ZERO key	To increase the unit mass number by one.
MODE key	To decrease the unit mass number by one.
PRINT key	To select the unit mass number to be used.
CAL key	To cancel the operation and go to step 5.

- 5 To re-store the unit mass or perform Automatic Counting Accuracy Improvement (ACAI) on the re-stored unit mass, follow the procedure described in “12. COUNTING MODE (PC)”.

Notes

- **ACAI can not be performed directly on the recalled unit mass.**
- **Using “UN:mm” command, the unit mass can be recalled (mm represents 01-20, which corresponds to P01-P20).**

14-5 Memory for Upper/lower limit values

- Upper/lower limit values stored in memory can be selected easily by pressing the **MODE** key.
- Storage capacity for the 3-level comparison is 20 sets of upper/lower limit values (code numbers **001-020**). "**001**" is to store the upper and lower limit values that are set in the function table.
- The code number appears in the upper left of the display to label the value.
- Using commands, the upper/lower limit values can be recalled and changed.

Notes

- If the data memory function is used, the "Title block" and "End block" can not be output.
- This function is not available when the BCD output (OP-01) is installed.

Setting the function table

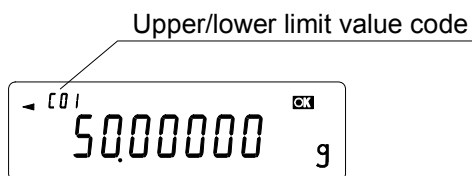
- 1 Set the "Data memory (*DATA*)" parameter to "4".

Note

If "**001**" appears blinking in the upper left of the display, delete the data in memory.

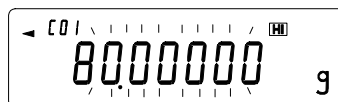
Inputting the upper/lower limit values (3-level comparison)

- 1 Display the weighing mode.



- 2 Press and hold the **PRINT** key until the balance enters the upper/lower limit value selection mode as shown below.

Display example



The upper limit value of the currently selected code is displayed.

- 3 Select the code and upper/lower limit values to be used using the following keys.

RE-ZERO key

To switch the upper/lower limit values or codes (increases by one)

MODE key

To switch the upper/lower limit values or codes (decreases by one)

Code	Display	RE-ZERO key, displaying order	MODE key, displaying order
C01	Upper limit HI	↓	↑
	Lower limit LO		
C02	Upper limit HI		
	Lower limit LO		
...	...		
C20	Upper limit HI		
	Lower limit LO		

PRINT key

To display the upper or lower limit value of the code selected and to return to the weighing mode.

CAL key

To cancel the operation and return to the weighing mode.

- 4 To change the upper or lower limit value of the selected code, press the **SAMPLE** key. The balance enters the value inputting mode.



Change the value using the following keys.

SAMPLE key

To select the digit to change the value.

RE-ZERO key

To set the value of the digit selected.

MODE key

To change the polarity.

PRINT key

To store the change, display **End** and return to the upper/lower limit value selection mode.

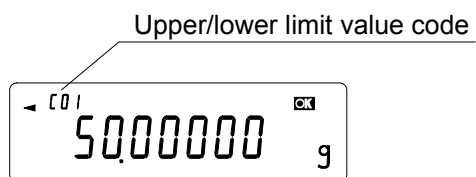
CAL key

To cancel the changes and return to the upper/lower limit value selection mode.

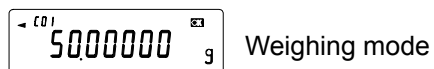
- 5 Enter the upper and lower limit values as necessary and press the **CAL** key. The balance returns to the weighing mode with the upper and lower limit value, of the code entered last, valid.

Switching the upper/lower limit values (3-level comparison)

- 1 Display the weighing mode.



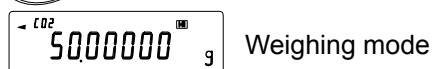
- 2 Press the **MODE** key to select the upper/lower limit value code.



- 3 Press the **PRINT** key to return to the weighing mode.



or leave as is



15. PROGRAMMABLE-UNIT (AD-4212A only)

This is a programmable unit conversion function. It multiplies the weighing data in grams by an arbitrary coefficient set in the function table and displays the result.

The coefficient must be within the range between the minimum and maximum shown below. If the coefficient set is beyond the range, an error is displayed and the balance returns to the coefficient setting mode, prompting to enter an appropriate value. A coefficient of 1 was set at the factory.

Model	Minimum coefficient	Maximum coefficient
AD-4212A-100	0.000001	10000
AD-4212A-200/600/1000		1000

Operation

- 1 Press and hold the **[SAMPLE]** key until **bRSFnC** of the function table is displayed, then release the key.
- 2 Press the **[SAMPLE]** key several times to display **MLt**.
- 3 Press the **[PRINT]** key. The balance enters the mode to confirm or set the coefficient.

Confirming the coefficient

- 4 The current coefficient is displayed with the first digit blinking.
 - When it is not to be changed, press the **[CAL]** key and proceed to step 6.
 - When it is to be changed, press the **[RE-ZERO]** key and proceed to step 5.

Setting the coefficient

- 5 Set the coefficient using the following keys.

[SAMPLE] key To select a digit to change the value. The selected digit blinks.

[RE-ZERO] key To change the value.

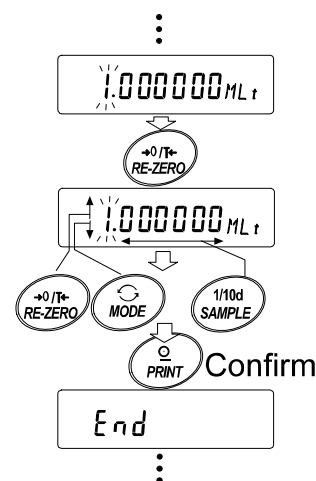
[MODE] key To change the decimal point position.

Each time the switch is pressed, the decimal point position changes as follows:

→ 0.000001 → 00.00001 → ... → 000000.1 → 0000001

[PRINT] key To store the new setting, display **End** and go to step 6.

[CAL] key To cancel the new setting and go to step 6.



Selecting the programmable-unit (MLt)

- 6 The balance displays **Unit**. Press the **[PRINT]** key to enter the unit selection mode. Select the programmable-unit (MLt) as described in “5-2 Changing the Unit”.
- 7 Press the **[CAL]** key to exit the programmable-unit function and return to the weighing mode.

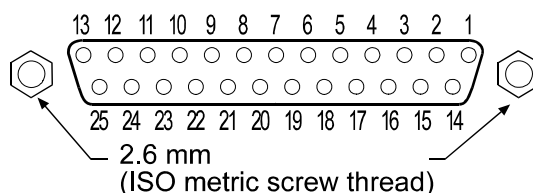
Using the function

Perform weighing as described in “6-1 Basic Operation (Gram Mode)”. After weighing, the balance displays the result (weighing data in grams x coefficient).

16. I/O UNIT SPECIFICATIONS (Standard interface)

16-1 RS-232C/Comparator Contact Output/External Contact Input

D-Sub 25 pin numbers



D-Sub 25 pin assignments

Pin No.	Signal name	Interface type	Direction	Description
1	FG		-	Frame ground
2	RXD	RS-232C	Input	Receive data
3	TXD	RS-232C	Output	Transmit data
4	RTS	RS-232C	Input	Ready to send
5	CTS	RS-232C	Output	Clear to send
6	DSR	RS-232C	Output	Data set ready
7	SG	RS-232C/external contact input	-	Signal ground
9	LL	Comparator	Output	Output LL (Only when five-level comparison is selected)*
12	HH	Comparator	Output	Output HH (Only when five-level comparison is selected)*
16	LO	Comparator	Output	Output LO
18	PRINT	External contact input	Input	Same as the PRINT key
19	RE-ZERO	External contact input	Input	Same as the RE-ZERO key
21	COM	Comparator	-	Common
23	HI	Comparator	Output	Output HI
25	OK	Comparator	Output	Output OK
Others	-	-	-	No connection

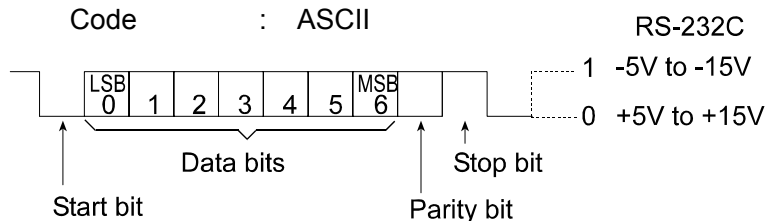
* AD-4212B: standard, AD-4212A: when OP-04 is installed

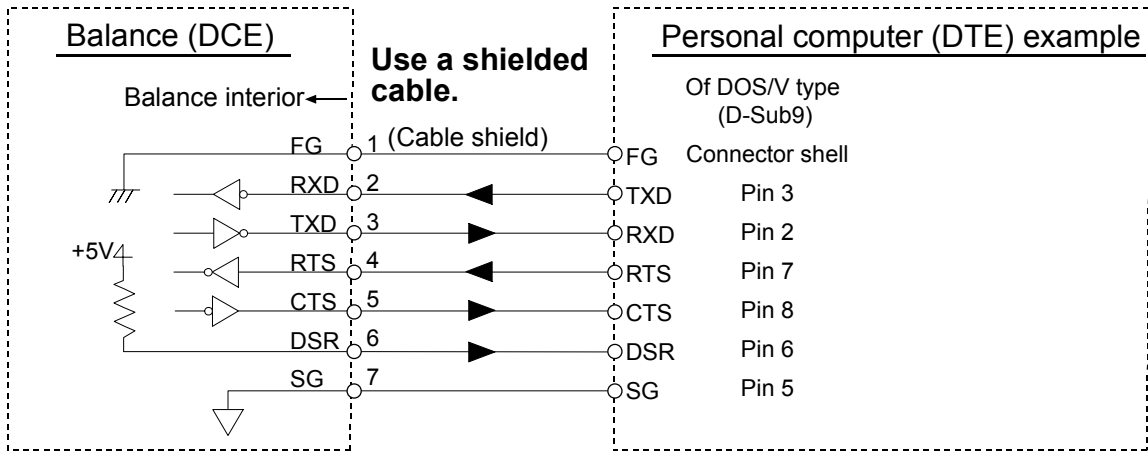
RS-232C

The balance is a DCE device. Connect the balance to a personal computer (DTE) using a straight through cable.

Transmission system : EIA RS-232C
 Transmission form : Asynchronous, bi-directional, half duplex
 Transmission rate : 10 times/second or 5 times/second (same as data refresh rate)
 Data format : Baud rate : 600, 1200, 2400, 4800, 9600, 19200bps
 Data bits : 7 or 8 bits
 Parity : Even, Odd (Data bits 7 bits)
 None (Data bits 8 bits)
 Stop bit : 1 bit
 (When sending, 2 bits; receiving, 1 bit.
 A personal computer will function with either
 setting.)

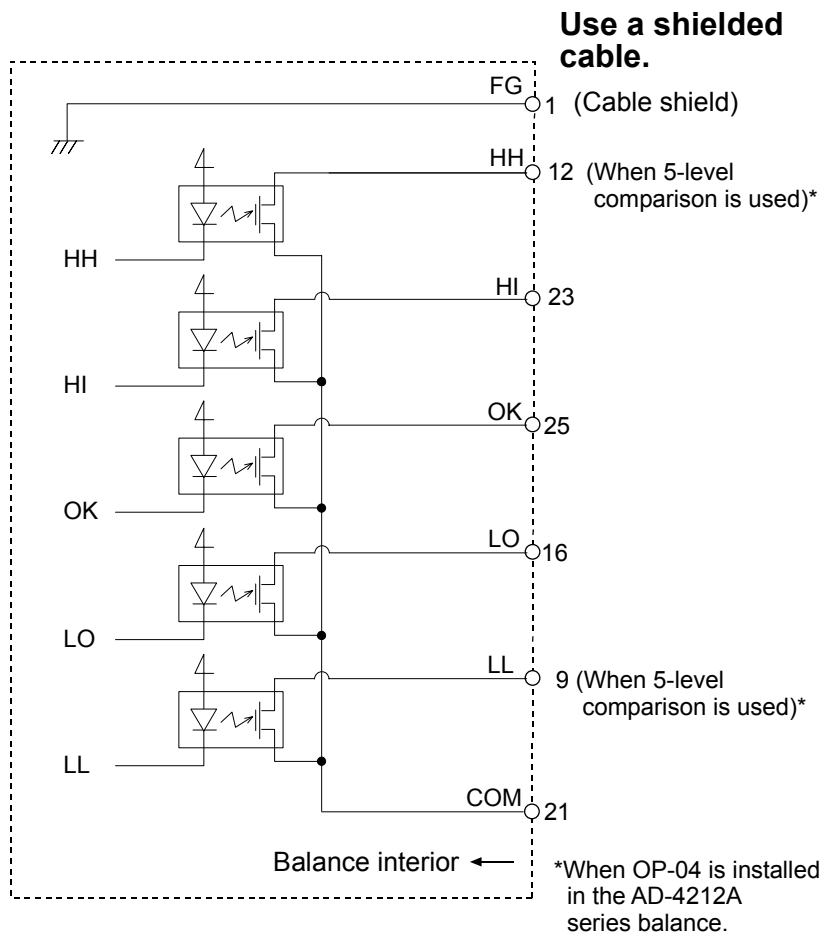
Code : ASCII





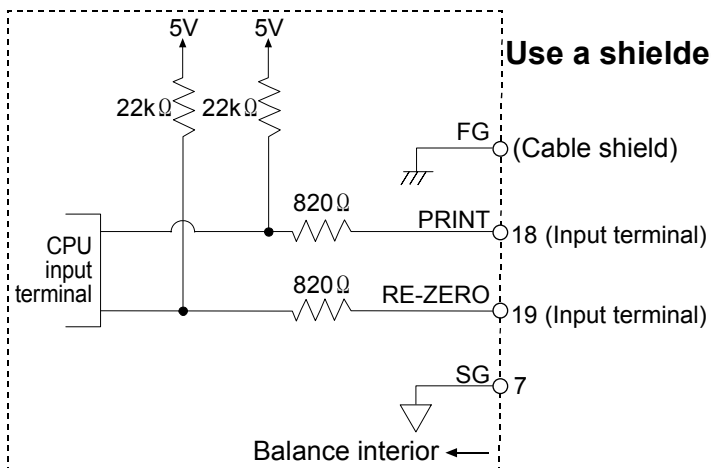
Comparator contact ratings

Maximum contact voltage	100VDC
Maximum contact current	100mADC
Maximum contact resistance	20 Ω

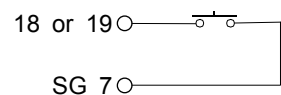


External contact input

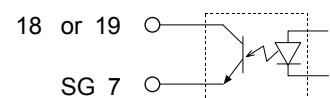
Minimum contact time 100 msec



(1) When a switch is used



(2) When a photocoupler is used



(Upon switch-ON, make the voltage between the input terminal and the SG terminal 0.2V or less)

17. CONNECTION TO PERIPHERAL EQUIPMENT

17-1 Connection to the AD-8121B Printer

Set the following parameters to use the AD-8121B printer.

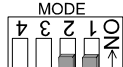
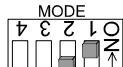
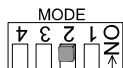
Class	Item	Factory setting	AD-8121B		
			Mode 1	Mode 2	Mode 3
Data output	<i>Prt</i> Data output mode	0	0, 1, 2, 4, 5	3	0, 1, 2, 4, 5
	<i>AP-P</i> Auto print polarity	0	*1	Not applicable	*1
	<i>AP-b</i> Auto print difference	1			
	<i>d-no</i> Data number output	0	0	0	0, 1
	<i>S-td</i> Time/date output	0	0	0	0, 1, 2, 3
	<i>S-id</i> ID number output	0	0	0	0, 1
	<i>PUSE</i> Data output pause	0	0	0	0, 1 *2
	<i>Alt-F</i> Auto feed	0	0	0	0, 1
Serial interface	<i>bPS</i> Baud rate	2	2	2	2
	<i>PtPr</i> Data bit, parity bit	0	0	0	0
	<i>CrLF</i> Terminator	0	0	0	0
	<i>tYPE</i> Data format	0	0	0	1
	<i>cts</i> CTS, RTS control	0	0	0	0

*1 Set the parameter when the data output mode is set to the auto print mode (*Prt* 1 or *Prt* 2).

*2 When multiple lines are to be printed, set the parameter to 1.

Note

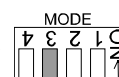
AD-8121B settings

Mode	AD-8121B DIP switches	Description
Mode 1		Prints upon data receipt Standard mode, statistical calculation mode
Mode 2		Prints using the AD-8121B DATA key or the AD-8121B built-in timer Standard mode, interval mode, chart mode
Mode 3		Prints upon data receipt Dump print mode

DIP switch 3: Handling unstable data

ON = To print unstable data

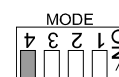
OFF = Not to print unstable data



DIP switch 4: Data input specification

ON = Use the current loop

OFF = Use the RS-232C



17-2 Connection to a Computer

The AD-4212A/B series balance is of the DCE type (Data Communication Equipment), which can be connected to a personal computer using the RS-232C interface.

Before connection, read the personal computer manual thoroughly.

Use a standard DCE cable for connection (cable type: straight through).

17-3 Using Windows Communication Tools (WinCT)

When Windows is used as an operating system in a personal computer, the provided WinCT software can be used to transmit the weighing data to the personal computer.

The current version of the WinCT can be downloaded from the A&D website.

The WinCT software has two communication methods: “RsCom” and “RsKey”. For details on WinCT, refer to the WinCT instruction manual.

RsCom

- Can transmit commands to control the balance.
- Can make bi-directional communication between the balance and a personal computer using the RS-232C interface.
- Can display or store the data using a text file format. Can also print the data using a printer connected to the personal computer.
- When several ports of a personal computer have balances connected, can communicate with each balance simultaneously.
- Can share a personal computer with other application software.
- Can receive the balance GLP report.

RsKey

- Can transmit the weighing data output from the balance directly to other application software such as Microsoft Excel.
- Can be used with most application software.
- Can receive the balance GLP report.

Note

Windows and Excel are registered trademarks of Microsoft Corporation.

Using the WinCT software, the balance can do the following:
--

1 Analyzing the weighing data and the statistics with “RsKey”

The weighing data can be input directly into an Excel worksheet. Then, Excel can analyze the data to obtain total, average, standard deviation, maximum and minimum value, and display them in a graph.

2 Controlling the balance using commands from a personal computer

By using “RsCom”, the personal computer sends commands such as “re-zero” or “send weighing data” to the balance and controls the balance.

3 Printing the balance GLP report using your printer

The balance GLP report can be printed using a printer connected to the personal computer.

4 Receiving weighing data at a certain interval

The weighing data can be received at a certain interval and data characteristic with elapsed time can be obtained.

5 Using the AD-4212A/B series balance memory function

The data can be stored in the balance’s memory. Of the data stored, the weighing data and calibration data can be transmitted to a personal computer at one time.

6 Using a personal computer as an external indicator

With the “RsKey” test mode function, a personal computer can be used as an external weight indicator for the balance. (To do this, set the balance data output mode to stream mode.)

18. COMMANDS

18-1 Command List

Commands to query weighing data

C	Cancels the S or SIR command.
Q	Requests the weighing data immediately.
S	Requests the weighing data when stabilized.
SI	Requests the weighing data immediately.
SIR	Requests the weighing data continuously.

Commands to control the balance

CAL	Same as the CAL key.
OFF	Turns the display off.
ON	Turns the display on.
P	Same as the ON:OFF key
PRT	Same as the PRINT key
R	Same as the RE-ZERO key
SMP	Same as the SAMPLE key.
U	Same as the MODE key (Confirm the upper/lower limit values)
HH:***. *****_g HI:***. *****_g LO:***. *****_g LL:***. *****_g	Sets the upper and lower limit values. HH: Secondary upper limit value HI: Upper limit value LO: Lower limit value LL: Secondary lower limit value The unit is what is displayed in the weighing mode. Use a unit of three digits in A&D standard format. Command e.g.: HI:100.00000 _g (To set the upper limit value to 100 g: _g indicates a space.)
?HH ?HI ?LO ?LL	Outputs the upper and lower limit values. ?HH: Secondary upper limit value ?HI: Upper limit value ?LO: Lower limit value ?LL: Secondary lower limit value ?HI response e.g.: HI,+100 .00000 _g

Commands to query memory data

MCL	Deletes all weighing data in memory.
MD:nnn	Deletes weighing data with the data number nnn.
?MA	Outputs all weighing data in memory.
?MQnnn	Outputs weighing data with the data number nnn.
?MX	Outputs the number of weighing data in memory.
UN:mm	Recalls the unit mass stored in memory with the number of mm (01-20).
?UN	Outputs the unit mass number of the selected unit mass. ?UN response e.g.: UN,01
CN:mm	Changes to the upper/lower limit value in memory with the number of mm. (mm is the upper/lower limit value code number. Standard=01 to 20)
?CN	Outputs the upper/lower limit value code number of the selected limit value.

Notes: nnn indicates a three-digit numerical value.

The command is sent to the balance with the terminator selected in the "Terminator (CRLF)" parameter of "Serial interface (5, F)" added.

18-2 Acknowledge Code and Error Codes

When the “Serial interface function (S i F)” parameter is set to “E r d l”, the balance outputs <AK> code or error code to each command as follows:

<AK> (06h) Acknowledge in ASCII code.

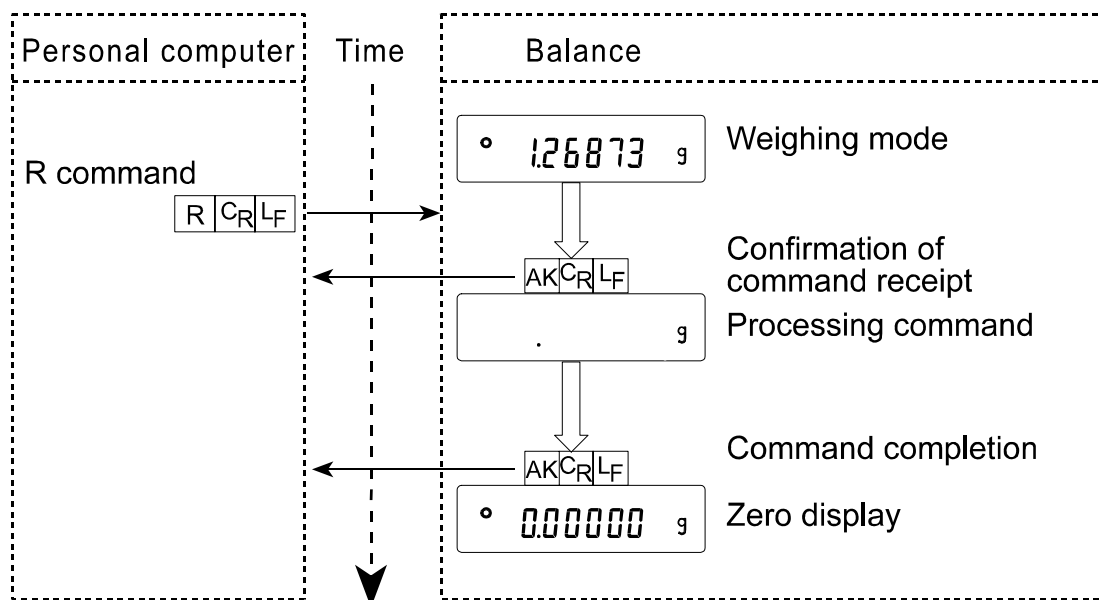
- When the balance receives a command to request data and can not process it, the balance transmits an error code (EC, Exx).
When the balance receives a command to request data and can process it, the balance outputs the data.
- When the balance receives a command to control the balance and can not process it, the balance transmits an error code (EC, Exx).
When the balance receives a command to control the balance and can process it, the balance transmits the acknowledge code.

Among commands to control the balance, the following transmit the acknowledge code both when the balance receives the command and when the balance has accomplished the command. If the command can not be processed properly, the balance transmits an error code (EC, Exx). This error can be released using the CAL command.

CAL command (Calibration command) ON command (Display ON command)

P command (Display ON/OFF comand) R command (RE-ZERO command)

R command example



- When a communication error has occurred due to external noise, or a parity error has occurred due to transmission error, the balance transmits an error code. In this case, send the command again.

18-3 Control Using CTS and RTS

Depending on the “ \overline{CTS} ” parameter of “Serial interface (\overline{SIF})”, the balance performs as follows:

\overline{CTS} 0

Regardless of whether the balance can receive a command or not, the balance keeps the CTS line Hi. The balance outputs data regardless of the condition of the RTS line.

\overline{CTS} 1

The CTS line is kept Hi normally. When the balance can not receive the next command (e.g. while the balance is processing last command), the balance sets the CTS line to Lo. The balance confirms the level of the RTS line before outputting a set of data. If the RTS level is Hi, the balance outputs data. If the RTS level is Lo, data is not output (The data is canceled).

18-4 Settings Related to RS-232C

Concerning the RS-232C, the balance has two functions: “Data output (*data*)” and “Serial interface (\overline{SIF})”. Set each function as necessary.

19. BCD OUTPUT (OP-01)

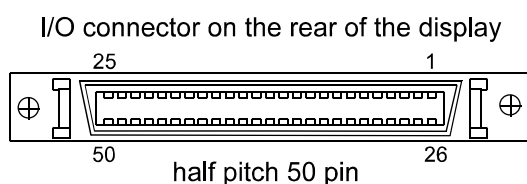
Weighing data will be output in BCD, in sync with the display refreshing. In addition, the polarity (+/-) and balance condition (stable/not stable, overload(positive/negative)) will be output.

The strobe signal allows inputting data easily. Inputting BUSY will hold data or prevent data that is being output from being rewritten. The logic of weighing data, status, and strobe signal can be switched individually in the function table.

Contact input is available for RE-ZERO and ON/OFF. (The same operations as pressing the **RE-ZERO** and **ON/OFF** keys.)

19-1 Connector Pin Nos. and Specifications

I/O connector located on the rear of the display unit



Plug (provided)

Part name	Product number	Manufacturer
Over mold cover	DX30M-50-CV	Hirose Electric
Plug unit (soldered type)	DX40M-50P	

The products above are subject to be replaced with the equivalent.

Cable

Wire size	AWG #28
Core configuration	7/0.127
O.D. of insulator	0.58

Use a shielded cable and connect the shield to the connector housing.

Pin assignments and I/O logic

Output pin assignments			
Pin No.	Signal		
26	1	10 ⁰	Data
27	2		
28	4		
29	8		
39	1	10 ¹	
40	2		
41	4		
42	8		
12	1	10 ²	
13	2		
14	4		
15	8		
16	1	10 ³	
17	2		
18	4		
19	8		
20	1	10 ⁴	
21	2		
22	4		
23	8		
46	1	10 ⁵	
47	2		
48	4		
49	8		
24	1	10 ⁶	
25	2		
30	4		
31	8		
32	1	10 ⁷	
33	2		
34	4		
35	8		
50	Polarity		State
45	Stability		
44	Over		
37	Status		Control signal
43	Strobe		
1	Output signal GND		
Housing	Shield		

Input pin assignments		
Pin No	Signal	
7	BUSY	
9	RE-ZERO	Switch
5	ON/OFF	
3	Input signal GND	
11	Not used (Reserved)	

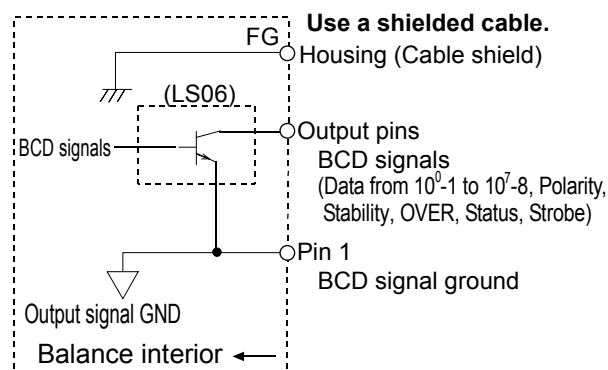
- The pins, which are not specified, have no connection. (Pins 2, 4, 6, 8, 10, 36, 38)

Output logic

Factory settings		
	When	State
Data	/	ON
Polarity	Positive or zero display	ON
Stability	Stabilization indicator ON	ON
Over	E , $-E$ display	ON
Strobe	Data receiving enabled*	ON
Status	Weighing	ON

*Data refresh when OFF→ON

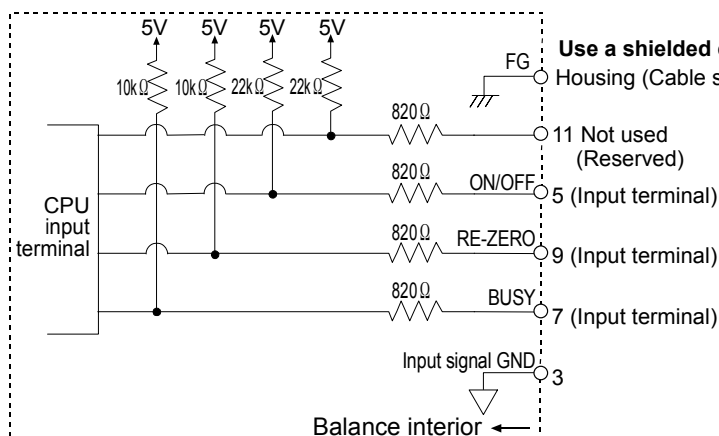
- All output, open collector; withstand voltage 30 V; no pull-up resistor; low-level output current 48 mA
- Output logic of data, status, and strobe can be switched individually in the function table *bcd*.



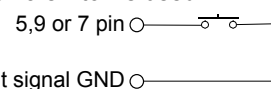
Input logic

BUSY	Data will be held during ON (when connected to input signal GND).
Input by switch	Valid when ON (when connected to input signal GND).

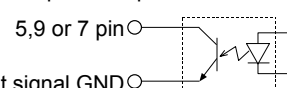
- All input, no voltage contact or open collector (connected to 5 V internally)



(1) When a switch is used



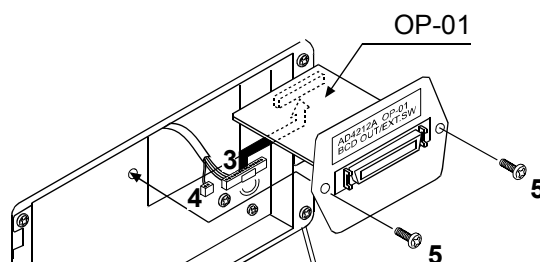
(2) When a photocoupler is used



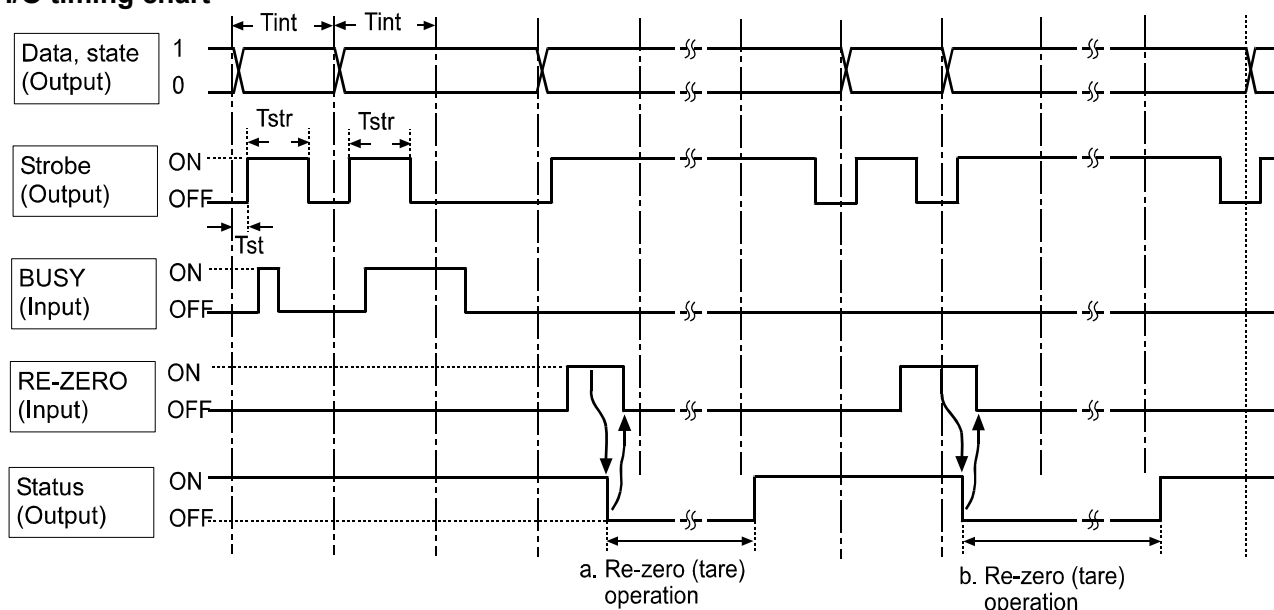
(Upon switch-ON, make the voltage between the input terminal and the input signal GND terminal 0.2V or less)

OP-01 installation procedure

- 1 Remove the two screws that secure the I/O unit to the rear of the display unit.
- 2 Remove the I/O unit and disconnect the two cable connectors.
- 3 Connect the 14-pin cable connector that was removed in step 2 to the OP-01 connector.
- 4 Leave the 2-pin cable connector as is.
- 5 Secure the OP-01 board to the rear of the display unit using the two screws.



I/O timing chart



Note

The time to start re-zero operation differs, depending on the timing of the re-zero input:

- a. To enter re-zero operation without data update
- b. To enter re-zero operation after data update

In addition, the time to complete re-zero operation is not constant due to ambient conditions such as external disturbance or vibration.

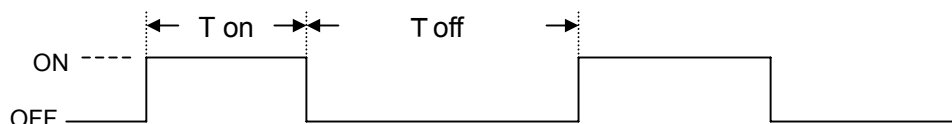
Using the status signal, confirm that RE-ZERO input is accepted or re-zero operation is complete.

"BUSY input ON" is the condition that pin 7 is connected to input signal GND (pin 3).

"RE-ZERO input ON" is the condition that pin 9 is connected to input signal GND (pin 3).

T int	Data output interval	Approx. 100 msec (Approx. 200 msec when the data refresh rate is 5 times/second.)
T str	Strobe pulse width	Approx. 70 msec (Approx. 170 msec when the data refresh rate is 5 times/second.)
T st	Data setup	10 μ sec or less
	Data refresh rate	1 μ sec or less

"Switch input ON" is the condition that is connected to input signal GND (pin 3).



T on, T off : 100 m sec or longer

20. EXTENDED FUNCTIONS (AD-4212A only)

The AD-4212A series balance has several extended functions equipped for special applications or to troubleshoot when using the standard functions.

Some settings of the extended functions may affect the weighing accuracy. Therefore, they are set to disabled at the factory when shipped. To enable the extended functions, set the function switch "Extended functions" to "I" (To use the extended functions). For details, refer to "9-1 Permit or Inhibit".

When "To use the extended functions" is selected, one item has its setting range extended as shown below and some more items are added as shown on the next page.

Class	Item	Parameter	Description		
bR5FnC Environment Display	Stability band width	0	<div> <div>Strict judgment</div> <div> <div></div> <div></div> </div> <div>Less strict judgment</div> </div>	(±1 digit)	When the weight value is within a certain width (stability band with: $St-b$) for a certain period (stability detect time: $St-t$), the balance judges that the value is stable and illuminates the stabilization indicator. The extended functions extend the setting range. With the extended band width, the stabilization indicator illuminates even if the value is not stable.
		■ 1		(±2 digits)	
		2		(±3 digits)	
		3		(±4 digits)	
		4		(±5 digits)	
		5		(±6 digits)	
		6		(±7 digits)	
		7		(±8 digits)	
		8		(±9 digits)	
		9		(±10 digits)	

■ Factory setting

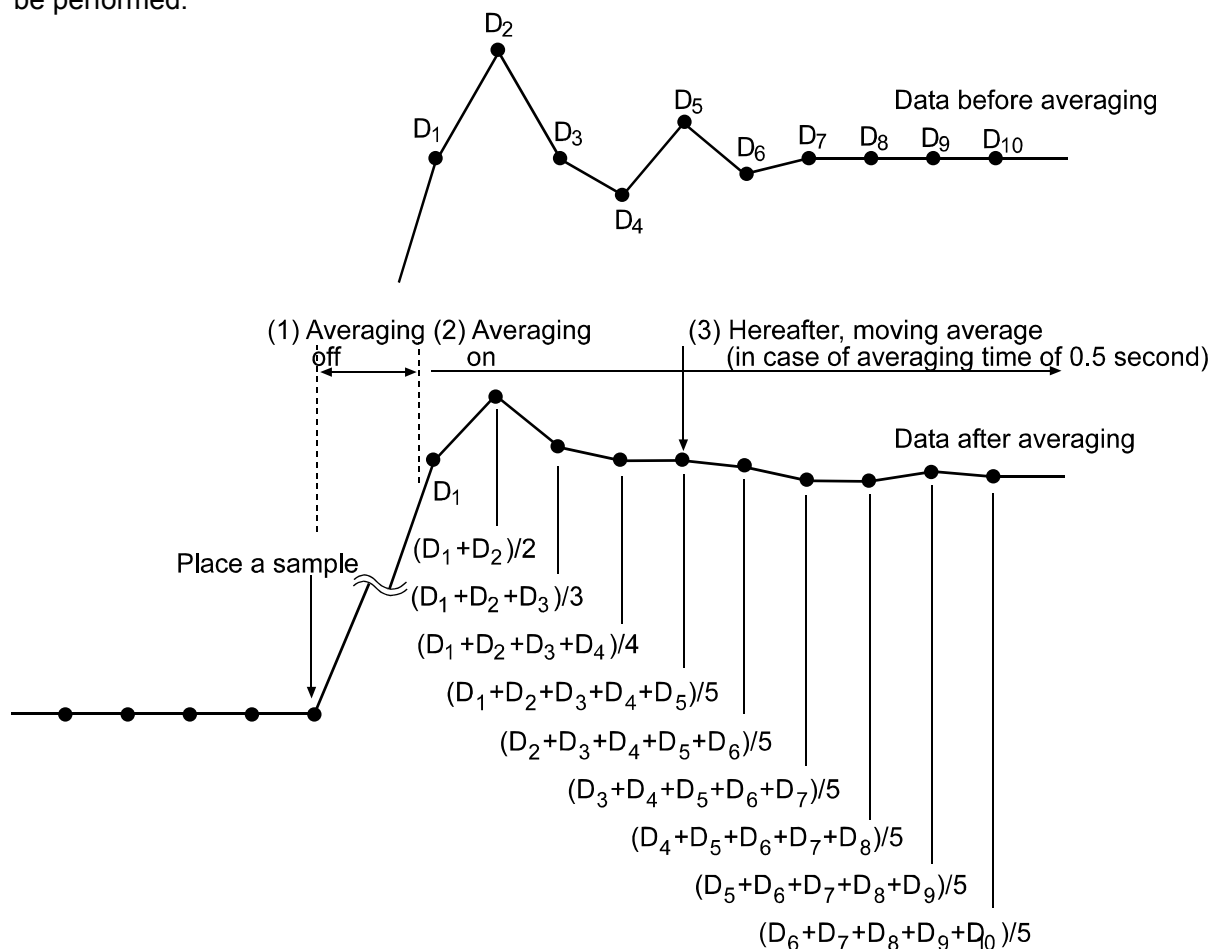
Class	Item	Parameter	Description	
<i>ErFnc</i> (Added by the extended functions. Appears after "id" in the function table.)	<i>St-t</i> Stability detect time	0	Standard setting	
		1	<div>Less strict judgment</div> <div></div> <div>Strict judgment</div>	(0.1 second)
		2		(0.2 second)
		3		(0.3 second)
		4		(0.4 second)
		5		(0.5 second)
		6		(0.6 second)
		7		(0.7 second)
		8		(0.8 second)
		9		(0.9 second)
	<i>St-r</i> Re-zero condition	0	Instantly regardless of the display condition	
		1	Instantly when stable	
		2	When stable for 0.2 second	
		3	When stable for 0.3 second	
		4	When stable for 0.4 second	
		5	When stable for 0.5 second	
		6	When stable for 0.6 second	
		7	When stable for 0.7 second	
		8	When stable for 0.8 second	
		9	When stable for 0.9 second	
	<i>Fl-b</i> Averaging range	0	Standard setting	
		1	<div>Narrow averaging range</div> <div></div> <div>Broad averaging range</div>	When the fluctuation of a weight is within the range, averaging starts to stabilize the value. When the fluctuation is small, for example, when a small amount of sample is weighed, averaging is always performed and response may be slow. Under such a condition change the parameter. (See "Averaging range and averaging time".)
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
	<i>Fl-t</i> Averaging time	0	Standard setting	
		1	None	
		2	<div>Short</div> <div></div> <div>Long</div>	(0.5 second)
		3		(1.0 second)
		4		(1.5 seconds)
		5		(2.0 seconds)
6		(2.5 seconds)		
7		(3.2 seconds)		
8		(4.8 seconds)		
9		(6.4 seconds)		

■ Factory setting

20-1 Description of "Averaging range" and "Averaging time"

Averaging range ($F\ l-b$) and averaging time ($F\ l-t$)

1. When the fluctuation of a weight value is beyond the range that is selected in " $F\ l-b$ ", the averaging operation is disabled and the display reflects the varying value.
2. Once the fluctuation becomes within the selected range, the averaging operation starts to stabilize the weight value.
3. The process of averaging increases. When the selected time is reached, moving averaging will be performed.



When a small amount of sample is weighed or is filled, the fluctuation of a weight value is too small to be beyond the selected range and the averaging operation is not disabled. Consequently moving averaging is always performed and it takes a longer time to reach the final weight value. Under such a situation, change the setting of " $F\ l-b$ " to a smaller range. But please note that the smaller the range is, the more prone to external disturbance the value will become.

21. MAINTENANCE

- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Use the original packing material for transportation.
- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.

22. TROUBLESHOOTING

22-1 Checking the Balance Performance and Environment

The balance is a precision instrument. When the operating environment or the operating method is inadequate, correct weighing can not be performed. Place a sample on the pan and remove it, and repeat this several times. If the balance seems to have a problem with repeatability or to perform improperly, check as described below. If improper performance persists after checking, contact the local A&D dealer for repair.

Checking that the balance performs properly (AD-4212A only)

- Check the balance performance using the self-check function.

Operation

- 1 Press and hold the **MODE** key until **RESPONSE** is displayed, and then release the key.
- 2 The balance automatically starts to check its internal performance
- 3 After self-check, the balance displays the results and returns to the weighing mode.

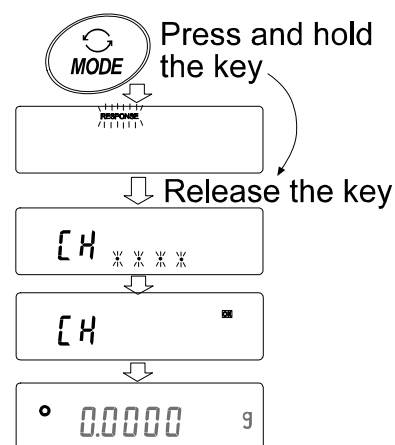
e.g. “**OK**”

The example above indicates that the result of the self check is good.

Note

If improper performance is found in the self check, the balance displays **[H na]. Contact the local A&D dealer for repair.**

- Check the balance repeatability using the calibration weight. Be sure to place the weight in the center of the weighing pan. Pay attention to the air flow and be sure to use the breeze break.
- Check the balance repeatability, linearity and calibrated value using external weights with a known value.



- When the balance is built into a system, remove the balance from the system. Place it on a solid table. Install the breeze break and perform checking.
When the balance proper performance is confirmed, refer to page 10 to set up the installation site.

Checking that the operating environment or weighing method is proper

Operating environment

- Is the weighing table solid enough
- Is the balance level? Refer to “3-1 Before Use”.
- Is the operating environment free from vibration and drafts? Has the stainless steel breeze break been installed?
- Is there a strong electrical or magnetic noise source such as a motor near the balance?
- Is there a heat source near the balance?

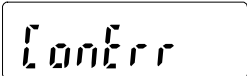

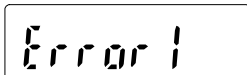
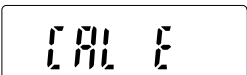
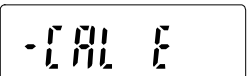
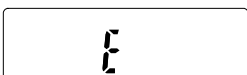

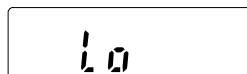
Weighing method

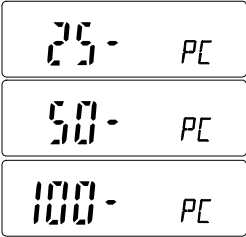
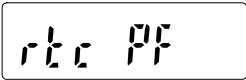



- Does the weighing pan touch the breeze break or anything? Is the weighing pan installed correctly?
- Is the RE-ZERO key pressed before placing a sample on the weighing pan? Or, is RE-ZERO performed using external contact input or an RS-232C command?
- Is the sample placed in the center of the weighing pan?
- Has the balance been warmed up for the appropriate duration before weighing?
AD-4212A series balance: 30 minutes or more
AD-4212B series balance: one hour or more
- Are the leveling feet of the weighing unit placed flat to the installation surface?
If not, the weight value will be unstable or the specified repeatability can not be obtained.
Improve the installation condition, by securing the weighing unit or reducing the vibration that is conveyed to the weighing unit.

Sample and container

- Has the sample absorbed or lost moisture due to the ambient conditions such as temperature or humidity?
- Has the temperature of the container been allowed to equalize to the ambient temperature? Refer to “3-2 When Building into a System”.
- Is the sample charged with static electricity? Refer to “3-2 When Building into a System”.
- Is the sample of magnetic material such as iron? Use much care when weighing magnetic materials. Refer to “3-2 When Building into a System”.

22-2 Error Codes

Display	Error code	Description
		Weighing unit connection error The weighing unit is not connected to the display properly. Refer to “2-2 Installing the Balance” to perform a proper connection.
 (CHECK NO)		Internal error Indicates an internal error as the result of self-check function. Repair is required. Contact the local A&D dealer.
	EC, E11	Stability error The balance can not stabilize due to an environmental problem. Refer to “3-2 When Building into a System” to prevent vibration, drafts, temperature changes, static electricity and magnetic fields, from influencing the balance. To return to the weighing mode, press the [CAL] key.
	EC, E20	Calibration weight error The calibration weight is too heavy. Confirm the calibration weight value. Press the [CAL] key to return to the weighing mode.
	EC, E21	Calibration weight error The calibration weight is too light. Confirm the calibration weight value. Press the [CAL] key to return to the weighing mode.
		Overload error A sample beyond the balance weighing capacity has been placed on the pan. Remove the sample from the pan.
		Weighing pan Error The weight value is too light. Confirm that the weighing pan is properly installed and calibrate the balance.
		Sample mass error The balance can not store the sample for the counting mode or for the percent mode because it is too light. Use a larger sample.

Display	Error code	Description
		<p>Unit mass error</p> <p>The sample unit mass for the counting mode is too light. Storing and using it for counting will cause a counting error.</p> <p>Add samples to reach the specified number and press the PRINT key.</p> <p>Pressing the PRINT key without adding samples will shift the balance to the counting mode. But, to acquire accurate weighing, be sure to add samples.</p>
		<p>Clock battery error</p> <p>The clock backup battery has been depleted.</p> <p>Press any key and set the time and date. The clock and calendar function works normally as long as the AC adapter is connected to the balance. If this error appears frequently, contact the local A&D dealer.</p>
 (Blinking)		<p>Memory full</p> <p>The amount of weighing data in memory has reached the maximum capacity.</p> <p>Delete data in memory to store new data. For details, refer to "14. DATA MEMORY".</p>
 (Illuminated)		<p>Memory full</p> <p>The amount of calibration or calibration test data in memory has reached the maximum capacity (50 sets).</p> <p>The data in memory will be deleted automatically to store new data. For details, refer to "14. DATA MEMORY".</p>
		<p>Memory type error</p> <p>Type of memory set in the function table and type of data stored are different.</p> <p>For details, refer to "14. DATA MEMORY".</p>
	EC, E00	<p>Communications error</p> <p>A protocol error occurred in communications.</p> <p>Confirm the format, baud rate and parity.</p>
	EC, E01	<p>Undefined command error</p> <p>An undefined command was received.</p> <p>Confirm the command.</p>
	EC, E02	<p>Not ready</p> <p>A received command can not be processed.</p> <p>e.g. The balance received a Q command, but not in the weighing mode.</p> <p>e.g. The balance received a Q command while processing a RE-ZERO command.</p> <p>Adjust the delay time to transmit a command.</p>

Display	Error code	Description
	EC, E03	Timeout error If the timeout parameter is set to " <i>L-UP 1</i> ", the balance did not receive the next character of a command within the time limit of one second. Confirm the communication.
	EC, E04	Excess characters error The balance received excessive characters in a command. Confirm the command.
	EC, E06	Format error A command includes incorrect data. e.g. The data is numerically incorrect. Confirm the command.
	EC, E07	Parameter setting error The received data exceeds the range that the balance can accept. Confirm the parameter range of the command.
Other errors		If the errors described above can not be released or other errors are displayed, contact the local A&D dealer.

22-3 Asking For Repair

If the balance needs service or repair, contact the local A&D dealer.

The balance is a precision instrument. Use much care when handling the balance and observe the following when transporting the balance.

- Use the original packing material.
- Remove the weighing pan from the weighing unit.

23. SPECIFICATIONS

		AD-4212A-100		AD-4212A-200		AD-4212A-600		AD-4212A-1000	
Weighing capacity		110 g		210 g		610 g		1100 g	
Maximum display		110.0084 g		210.084 g		610.084 g		1100.084 g	
Minimum weighing value (1 digit)		0.1 mg		1 mg					
Repeatability (Standard deviation)		0.15 mg		1 mg					
Linearity		±0.3 mg		±2 mg		±3 mg			
Stabilization time in seconds (typical at FAST under good environment)		0-30 g	1.1	0-30 g	0.8	0-30 g	0.9	0-30 g	0.9
		30-110 g	1.3	30-210 g	1.0	30-610 g	1.1	30-1100 g	1.1
Display refresh rate		10 times/second (5 times/second can be selected)							
I/O unit	RS-232C	Bi-directional, 600-19200 bps							
	Comparator contact output	3-level output							
	External contact input	RE-ZERO, PRINT							
Buzzer		Sounds the connected buzzer for 3-level comparison results (It becomes 5-level when OP-04 is installed)							
Sensitivity drift		±2 ppm/°C (10°C-30°C/50°F-86°F)							
Operating environment		5°C to 40°C (41°F to 104°F), 85% RH or less (No condensation)							
Calibration weight provided (Conforming to OIML Class E2)		50 g		100 g		200 g			
Applicable weight values		20 g, 50 g, 100 g		20 g, 50 g, 100 g, 200 g		20 g, 50 g, 100 g, 200 g, 300 g, 400 g, 500 g, 600 g		20 g, 50 g, 100 g, 200 g, 300 g, 400 g, 500 g, 600 g, 700 g, 800 g, 900 g, 1000 g	
Weighing unit	Dimensions	80 (W)×230 (D)×90 (H) mm				80 (W)×230 (D)×92.5 (H) mm			
	Weighing pan	50 × 50 mm				70 × 70 mm			
	Mass	Approx. 2 kg							
Display	Dimensions	237 (W) × 150 (D) × 155 (H) mm							
	Mass	Approx. 2 kg							
Connection cable		Approx. 2 m (between weighing unit and display)							
AC adapter		Confirm that the adapter type is correct for the local voltage and power receptacle type							
Power consumption		Approx. 15VA (supplied to the AC adapter)							
Counting mode	Minimum unit mass	0.1 mg		1 mg					
	Number of samples	10, 25, 50 or 100 pieces							
Percent mode	Minimum 100% reference mass	10.0 mg		100 mg					
	Minimum 100% display	0.01%、0.1%、1% (Depends on the reference mass stored.)							
Options	OP-01	BCD output, external contact input (RS-232C and comparator contact output disabled)							
	OP-04	RS-232C, 5-level comparator contact output, external contact input (Not field installable. Must be ordered with the balance for installation at the factory.)							
	OP-07*	Extension cable 3 m							
	OP-08	Ethernet interface (RS-232C and comparator contact output disabled)							
	OP-19	Stainless steel breeze break (Provided as standard for AD-4212A-100)							
	OP-20	Metal leveling foot							

- Only one extension cable can be used. The maximum distance between the weighing unit and the display unit is 5 m (connection cable 2 m + extension cable 3 m).

		AD-4212B-23	AD-4212B-101	AD-4212B-102	AD-4212B-201	AD-4212B-301	
Weighing capacity		21 g	110 g / 31 g*1	110 g	210 g	310 g	
Maximum display		21.000084 g	110.0084 g / 31.00009 g*1	110.00084 g	210.0084 g	310.0084 g	
Minimum weighing value (1 digit)		0.001 mg	0.1 mg / 0.01 mg*1	0.01 mg	0.1 mg		
Repeatability (Standard deviation)		Loaded on the pan 0 to 10 g: 0.003 mg*2 10 g or greater: 0.004 mg*2	0.1 mg / 0.05 mg*1	30 g	0.02 mg	0.1 mg	0.2 mg
				100 g	0.04 mg		
Linearity		±0.01 mg	±0.2 mg / ±0.05 mg*1	±0.1 mg	±0.2 mg	±0.3 mg	
Stabilization time (typical at FAST under good environment)		12 seconds	2.5 seconds / 4.0 seconds*1	4.0 seconds	2.5 seconds		
Display refresh rate		10 times/second (5 times/second can be selected)					
I/O unit	RS-232C	Bi-directional, 600-19200 bps					
	Comparator contact output	3-level or 5-level output					
	External contact input	RE-ZERO, PRINT					
Buzzer		Sounds the connected buzzer for 3-level or 5-level comparison results					
Sensitivity drift		±2 ppm/°C (10°C-30°C/50°F-86°F)					
Operating environment		5°C to 40°C (41°F to 104°F), 85% RH or less (No condensation)					
Calibration weight provided (Conforming to OIML Class E2)		1 g	50 g		100 g		
Applicable weight values		1 g, 2 g, 5 g, 10 g, 20 g	10 g, 20 g, 50 g, 100 g		10 g, 20 g, 50 g, 100 g, 200 g	10 g, 20 g, 50 g, 100 g, 200 g, 300 g	
Weighing unit	Dimensions	80 (W) × 230 (D) × 90 (H) mm					
	Weighing pan	φ34 mm			50 × 50 mm		
	Mass	Approx. 2.3 kg					
Display	Dimensions	237 (W) × 150 (D) × 155 (H) mm					
	Mass	Approx. 2 kg					
Connection cable		Approx. 2 m (between weighing unit and display)					
AC adapter		Confirm that the adapter type is correct for the local voltage and power receptacle type					
Power consumption		Approx. 15VA (supplied to the AC adapter)					
Counting mode	Minimum unit mass	0.1 mg					
	Number of samples	10, 25, 50 or 100 pieces					
Percent mode	Minimum 100% reference mass	1 mg	10.0 mg				
	Minimum 100% display	0.01%、0.1%、1% (Depends on the reference mass stored.)					
Options	OP-01	BCD output, external contact input (RS-232C and comparator contact output disabled)					
	OP-07*	Extension cable 3 m					
	OP-08	Ethernet interface (RS-232C and comparator contact output disabled)					
	OP-19	Stainless steel breeze break (Provided as standard)					
	OP-20	Metal leveling foot					

*1 Specifications when the precision range is used.

*2 With the instrument set to automatic, specifications when measured by loading and removing a 1g mass repeatedly.

Only one extension cable can be used. The maximum distance between the weighing unit and the display unit is 5 m (connection cable 2 m + extension cable 3 m).

24. DESIGNING A SPECIAL WEIGHING PAN

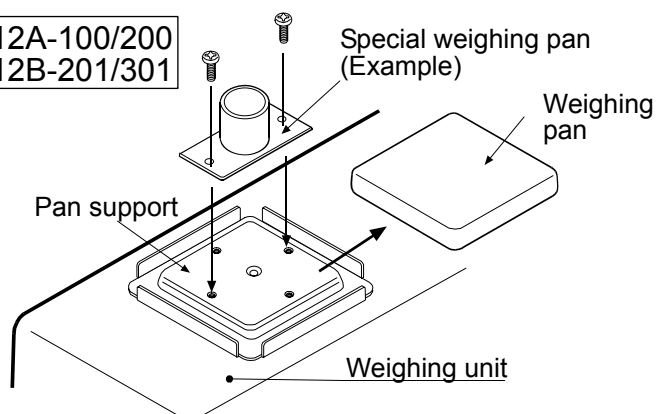
A weighing pan specially designed for the balance can be installed.

Design the weighing pan as described below:

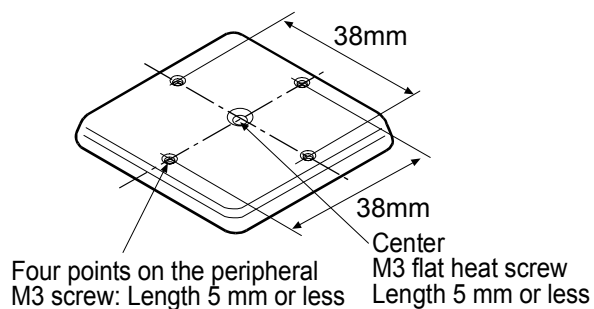
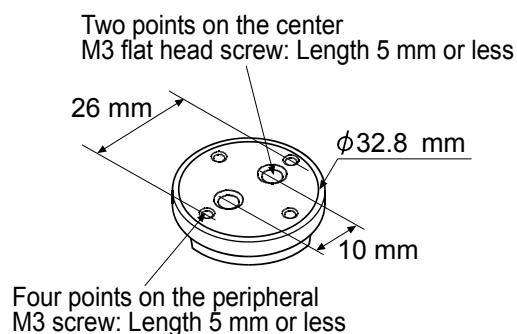
Using the pan support

The pan support can be removed.

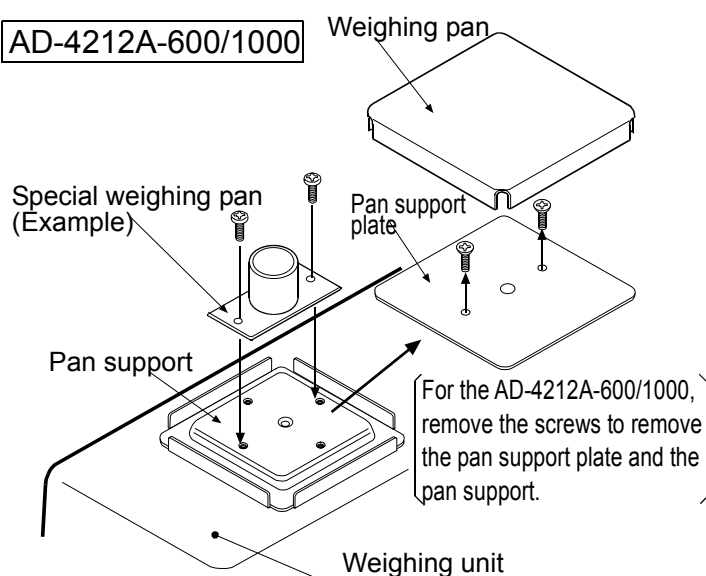
AD-4212A-100/200
AD-4212B-201/301



AD-4212B-23/101/102

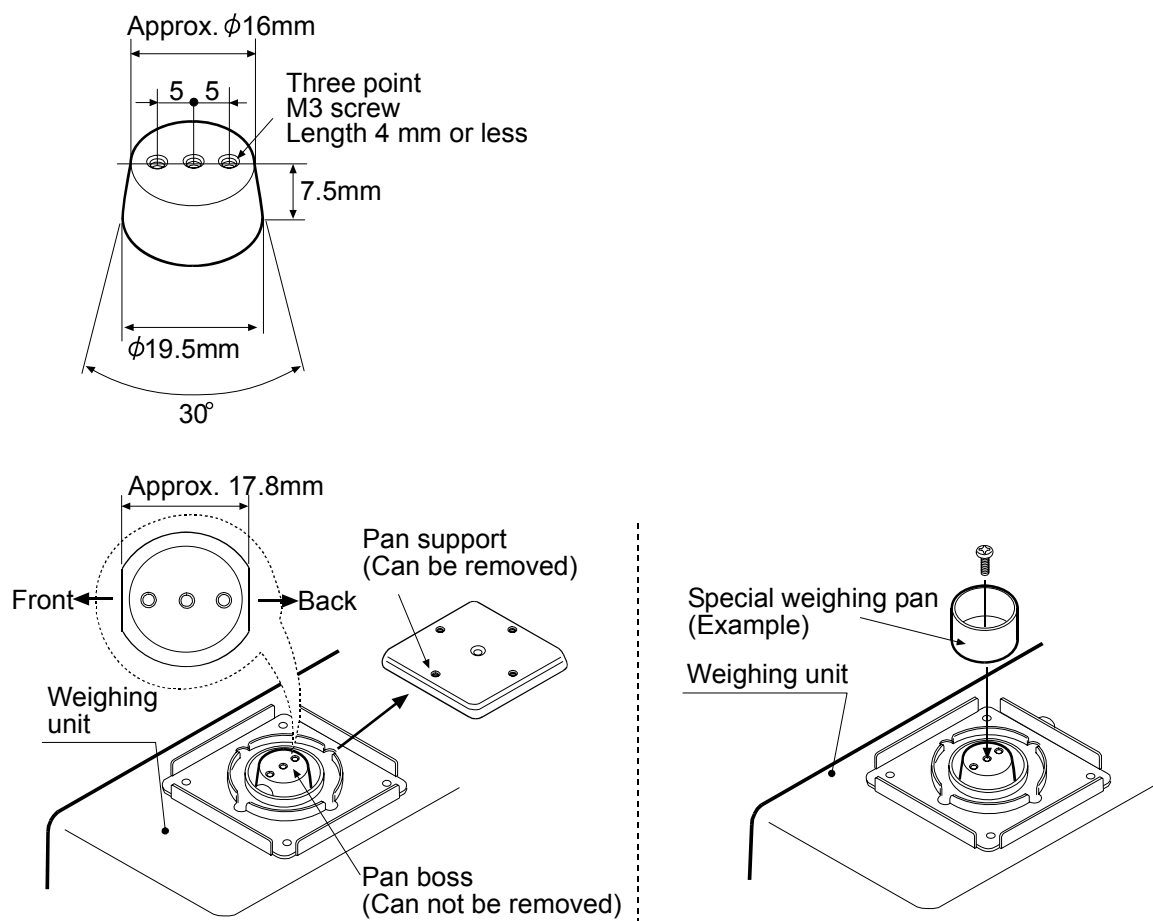


AD-4212A-600/1000



Using the pan boss

The pan boss can not be removed.



Shock absorber specifications

The internal shock absorber functions at about 2 kg (as a static force), to protect the mass sensor. A static force of less than 2 kg will not damage the mass sensor.

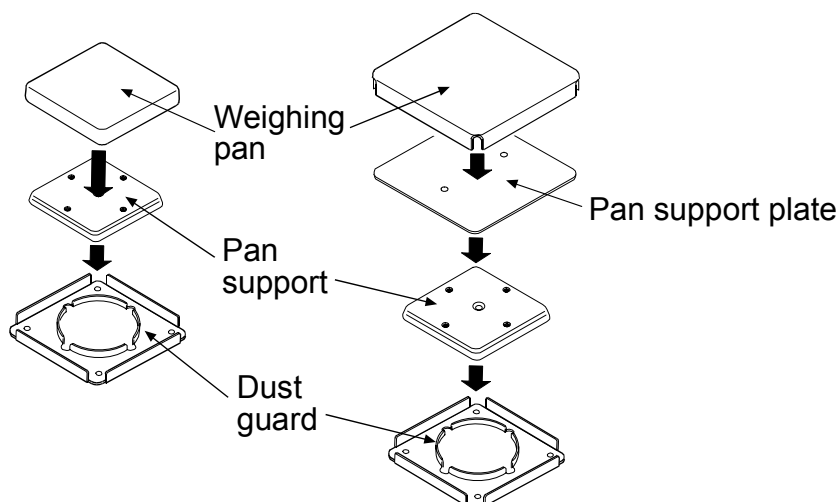
Mass of the special weighing pan (AD-4212A series balance)

Design the weighing pan so that the mass falls in the ranges shown in the table below:

Model	State	Mass of special weighing pan (g)
AD-4212A-100	Pan support is used (with weighing pan removed)	20 to 70
	Pan boss is used (with the weighing pan and pan support removed)	60 to 110
AD-4212A-200	Pan support is used (with weighing pan removed)	20 to 120
	Pan boss is used (with the weighing pan and pan support removed)	60 to 160
AD-4212A-600	Pan support is used (with weighing pan and pan support plate removed)	110 to 510
	Pan boss is used (with the weighing pan, pan support plate and pan support removed)	150 to 550
AD-4212A-1000	Pan support is used (with weighing pan and pan support plate removed)	110 to 1000
	Pan boss is used (with the weighing pan, pan support plate and pan support removed)	150 to 1040

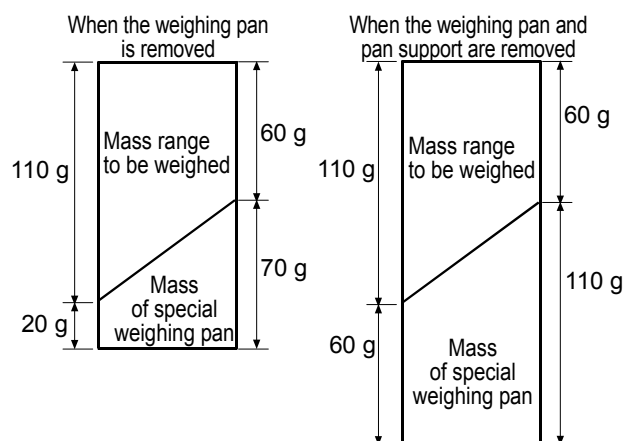
AD-4212A-100/200

AD-4212A-600/1000

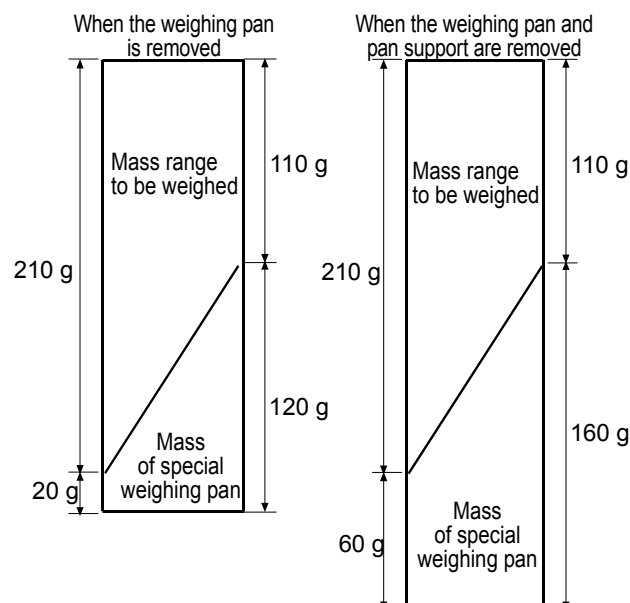


The weighing range for each pan design is shown below:

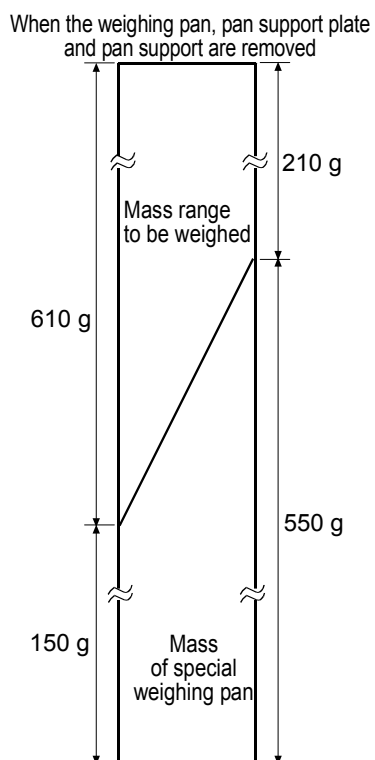
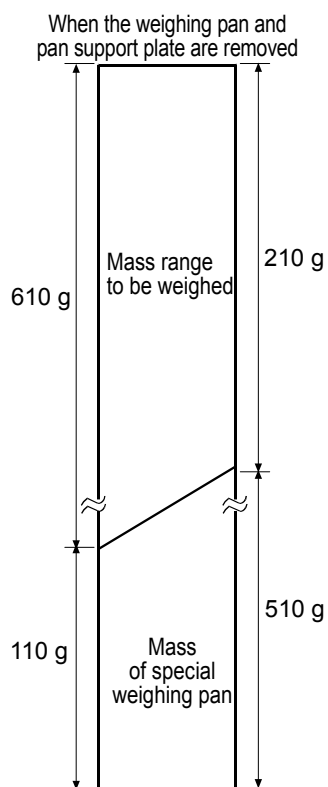
AD-4212A-100



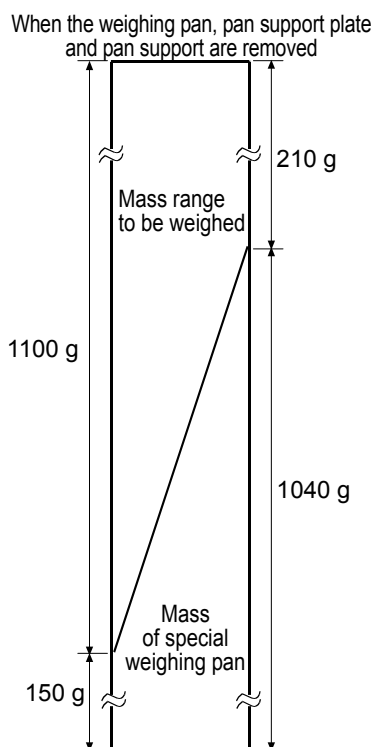
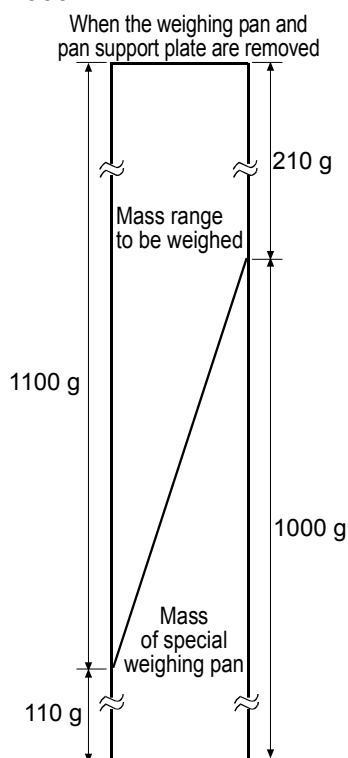
AD-4212A-200



AD-4212A-600



AD-4212A-1000



Notes

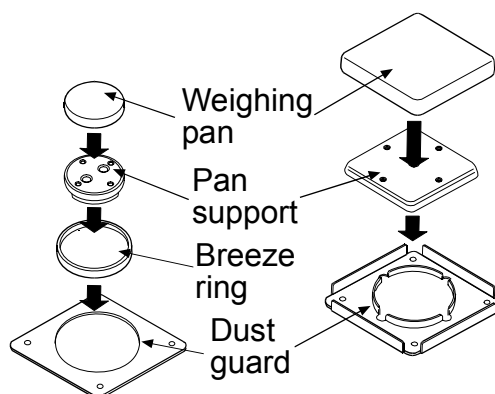
- If the balance is to be used in a range other than shown above, contact the local A&D dealer.
- To avoid the effect by static electricity or magnetism, use materials other than resin or magnetic materials when designing a special weighing pan.
- When a special weighing pan is used, the zero point may be shifted greatly right after the AC adapter is plugged in. Press the **RE-ZERO** key before weighing to cancel the amount of zero drift as necessary.

Mass of the special weighing pan (AD-4212B series balance)

Design the weighing pan so that the mass falls in the ranges shown in the table below:

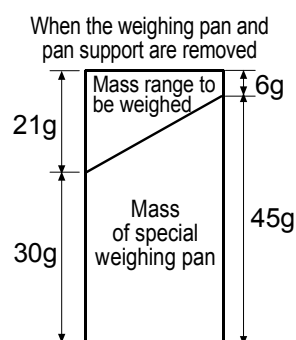
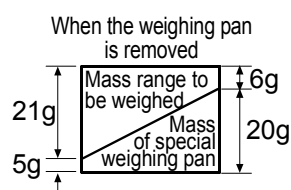
Model	State	Mass of special weighing pan (g)
AD-4212B-23	Pan support is used (with weighing pan removed)	5 to 20
	Pan boss is used (with the weighing pan and pan support removed)	30 to 45
AD-4212B-101/102	Pan support is used (with weighing pan removed)	5 to 55
	Pan boss is used (with the weighing pan and pan support removed)	30 to 80
AD-4212B-201	Pan support is used (with weighing pan removed)	20 to 120
	Pan boss is used (with the weighing pan and pan support removed)	60 to 160
AD-4212B-301	Pan support is used (with weighing pan and pan support plate removed)	20 to 220
	Pan boss is used (with the weighing pan, pan support plate and pan support removed)	60 to 260

AD-4212B-23/101/102 AD-4212B-201/301

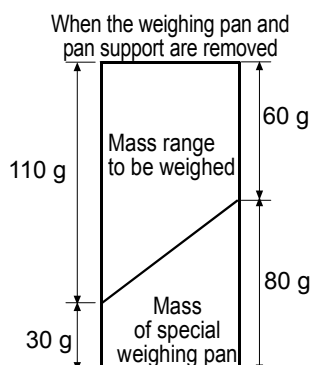
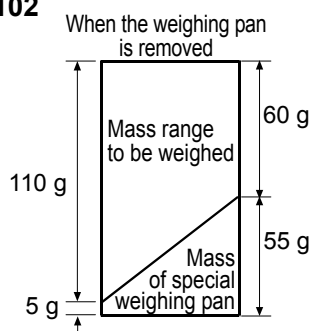


The weighing range for each pan design is shown below:

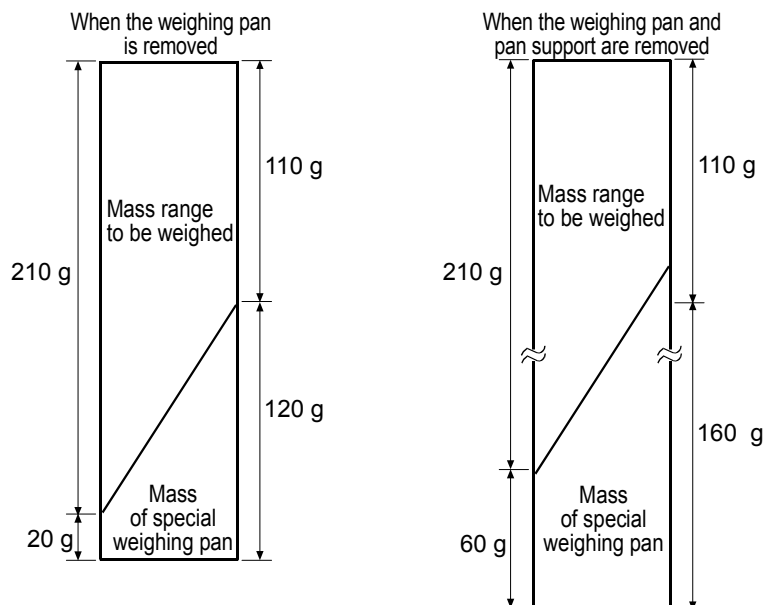
AD-4212B-23



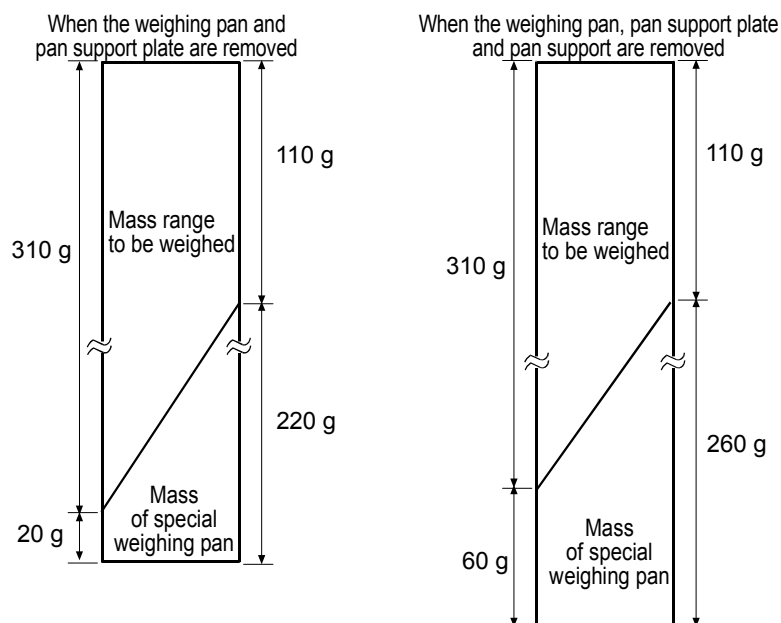
AD-4212B-101/102



AD-4212B-201



AD-4212B-301



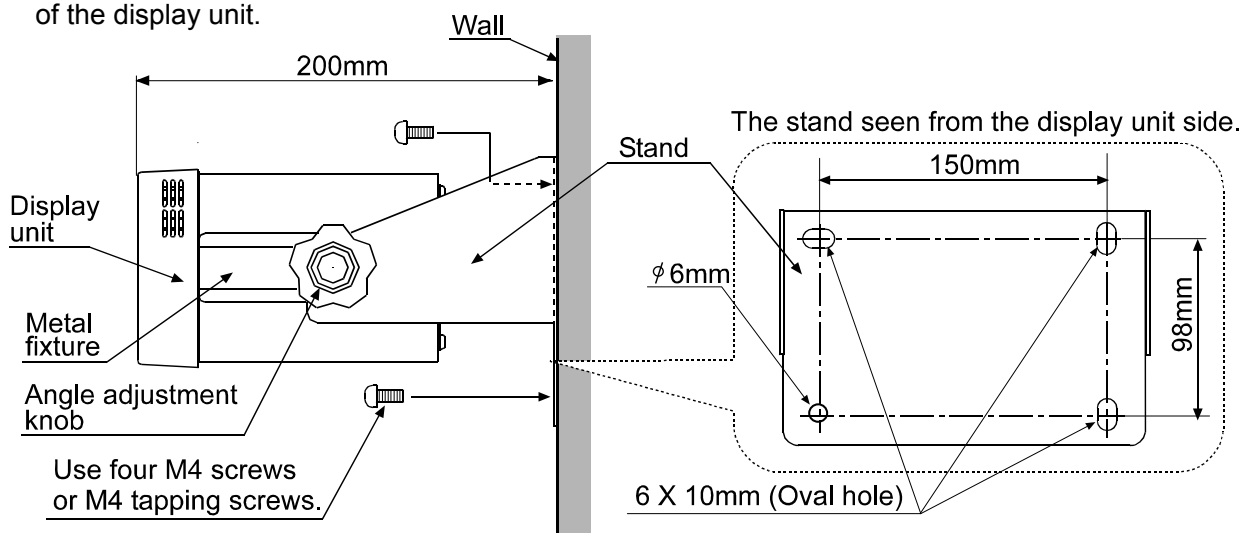
Notes

- If the balance is to be used in a range other than shown above, contact the local A&D dealer.
- To avoid the effect by static electricity or magnetism, use materials other than resin or magnetic materials when designing a special weighing pan.
- When a special weighing pan is used, the zero point may be shifted greatly right after the AC adapter is plugged in. Press the **RE-ZERO** key before weighing to cancel the amount of zero drift as necessary.

25. INSTALLING THE DISPLAY UNIT

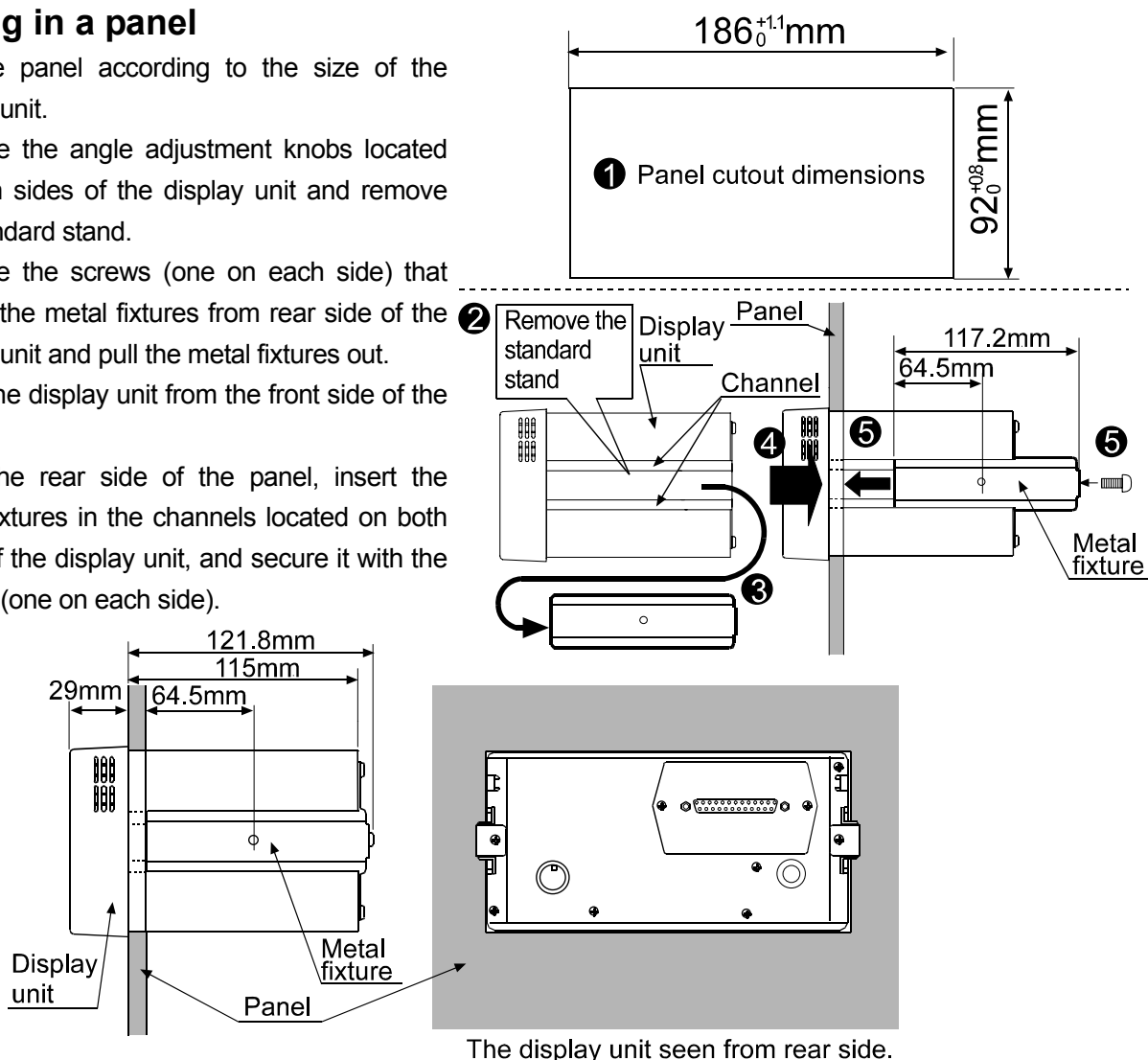
Installing the display unit on a wall using the standard stand

1. Secure the stand, that is attached to the display unit, on the wall using the four screws
2. Adjust the angle of the display unit and tighten the angle adjustment knobs located on both sides of the display unit.



Installing in a panel

1. Cut the panel according to the size of the display unit.
2. Remove the angle adjustment knobs located on both sides of the display unit and remove the standard stand.
3. Remove the screws (one on each side) that secure the metal fixtures from rear side of the display unit and pull the metal fixtures out.
4. Insert the display unit from the front side of the panel.
5. From the rear side of the panel, insert the metal fixtures in the channels located on both sides of the display unit, and secure it with the screws (one on each side).



26. ATTACHING THE MOUNTING FIXTURES

The mounting fixtures provided with the AD-4212A/B series balance are used to secure the weighing unit from above in a determined position, when the weighing unit is built into a system. To attach the fixtures to the weighing unit, use the screw holes after the three leveling feet are removed from the bottom of the AD-4212A/B series balance weighing unit.

Attachment Procedure

1. Remove the weighing pan, pan support and dust guard. Then, remove the three leveling feet.

Caution

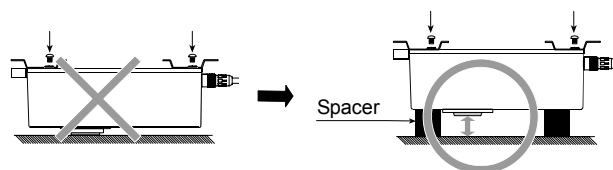
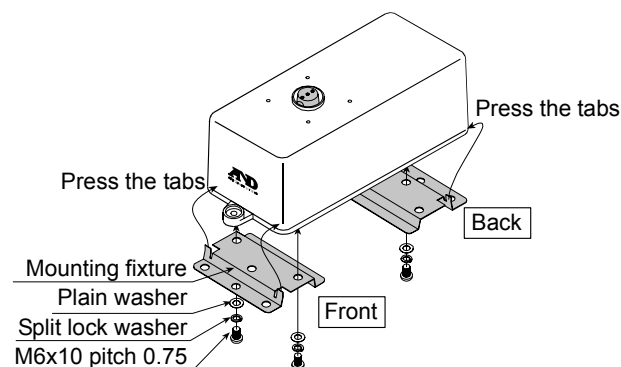
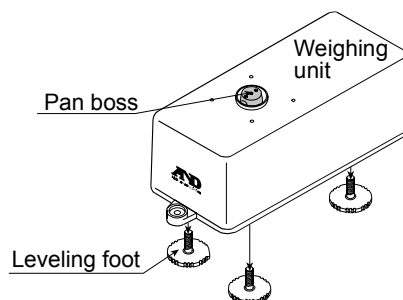
Removing any other screws from the bottom of the weighing unit could damage the weighing sensor.

2. Use the leveling feet screw holes to attach the mounting fixtures to the weighing unit.
Using the screws and washers provided with the mounting fixtures, secure the attaching fixtures to the weighing unit, two screws in the front and one screw in the back.

Notes

When attaching a mounting fixture, press the tabs against the weighing unit casing (one fixture in the front and another in the back) and determine the fixture position.

When the weighing unit is placed upside down to attach the mounting fixtures, use much care not to press on the pan boss directly. Applying excessive force to the pan boss may damage the weighing sensor.



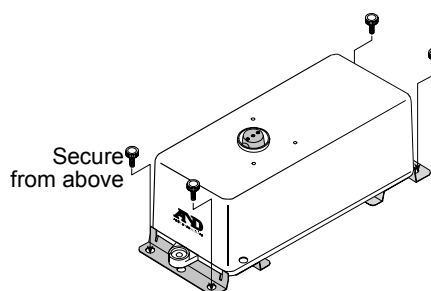
3. Secure the weighing unit from above.

Notes

The screws to secure the weighing unit to the weighing platform are not provided. Prepare appropriate screws with a size corresponding to the M6 screw.

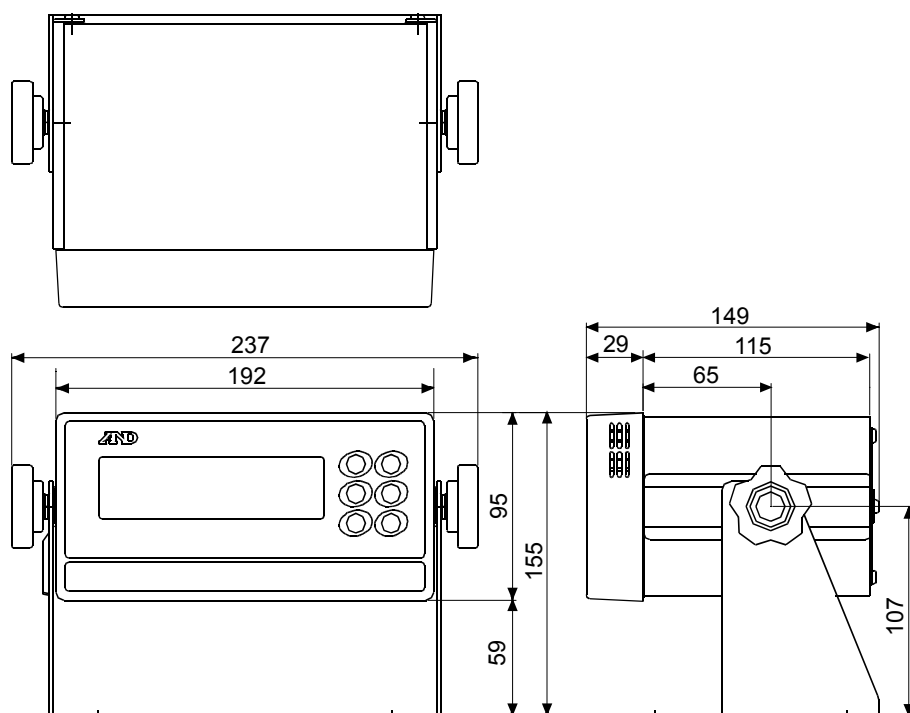
The screw hole diameter: 6.5 mm

When the leveling adjustment is difficult to perform due to the installation conditions, place a shim between the fixture and the securing surface, or use two nuts. If the adjustment is still difficult to perform, perform calibration before use. Then, the balance will function normally.



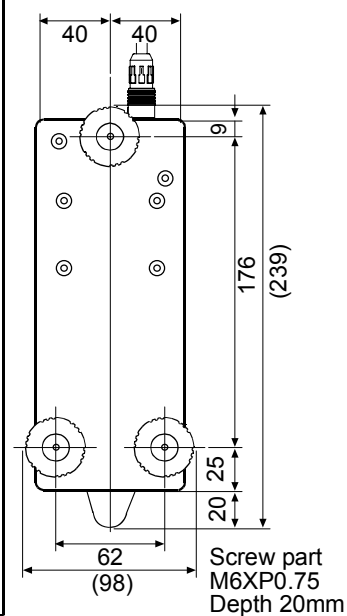
27. EXTERNAL DIMENSIONS

Display unit



Weighing unit
(Bottom)

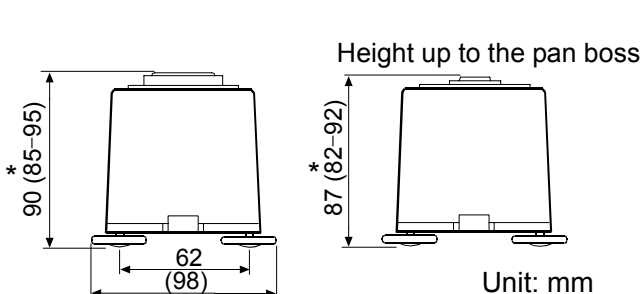
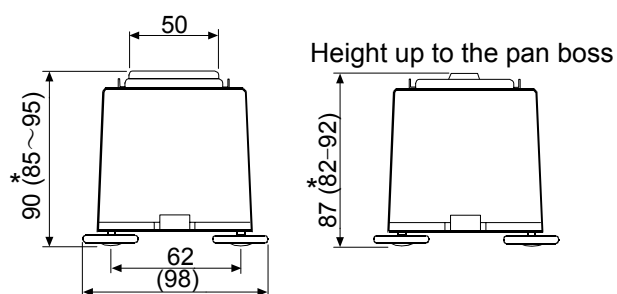
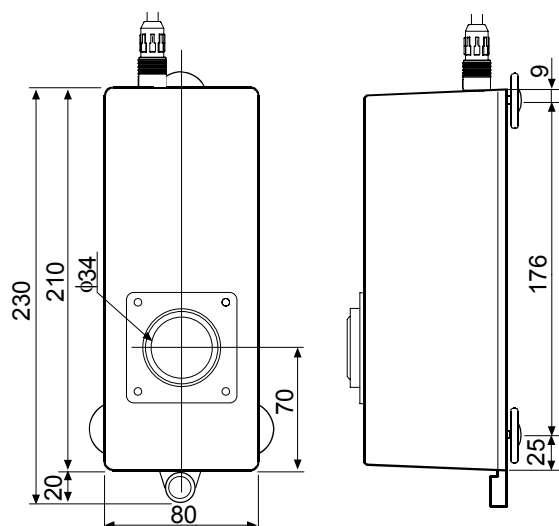
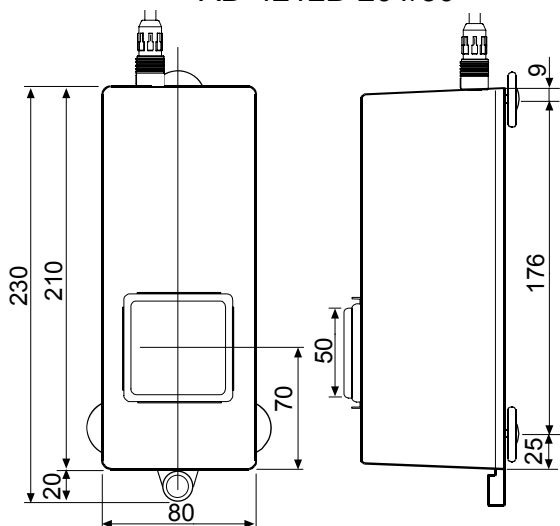
Same for all the models



Weighing unit

AD-4212A-100/200
AD-4212B-201/301

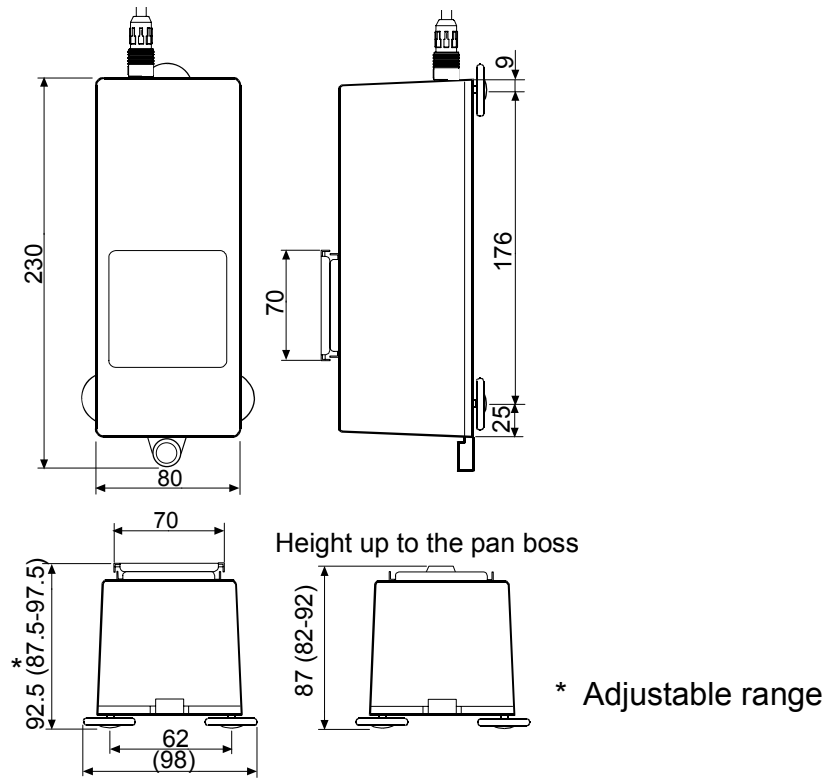
AD-4212B-23/101/102



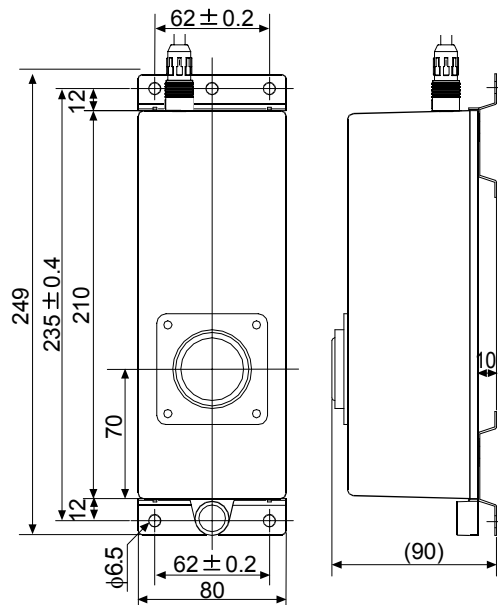
* Adjustable range

Unit: mm

AD-4212A-600/1000



Weighing unit with the mounting fixtures attached

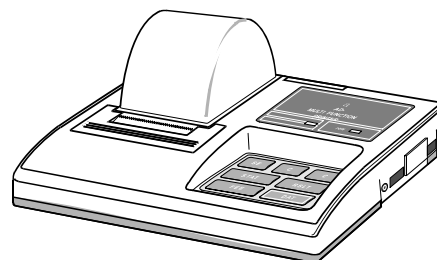


Unit: mm

28. OPTIONS

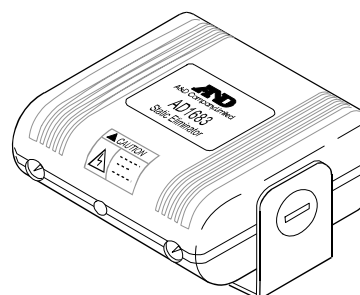
AD-8121B Printer

- Compact thermal dot-matrix printer
- Statistical function, clock and calendar function, interval print function, graphic print function, dump print mode
- 5 x 7 dots, 16 characters per line
- Print paper (AX-PP143, 45 (W) x 50 (L) mm , ø65 mm)
- AC adapter or alkaline battery.



AD-1683: DC static eliminator

- A compact design with efficient static elimination
- No air blowing from a fan allows precision weighing



AD-1684: Electrostatic field meter

- This option measures the amount of the static charge on the sample, tare or peripheral equipment and displays the result.
If those are found to be charged, discharge them using the AD-1683 DC static eliminator.

OP-01: BCD output/External contact input

OP-04: RS232C/Five-level comparator contact output (AD-4212A only)

- Only for the AD-4212A series balance. Order this option with the balance as only the factory can install it.

OP-07: Extension cable 3 m

OP-08: Ethernet interface

- Used to connect the balance to a LAN.
- The "WinCT-Plus" data communication software is provided as an accessory and can perform the following.
 - Acquire data from multiple balances connected to a LAN.
 - LAN connection enables reliable data acquisition.
 - Control these balances with commands.
 - Acquire data transmitted from balances.

Example: When pressing the **PRINT** key of the balance, data is output and is acquired by the computer.

- The stored data can be used with Microsoft Excel (if installed).

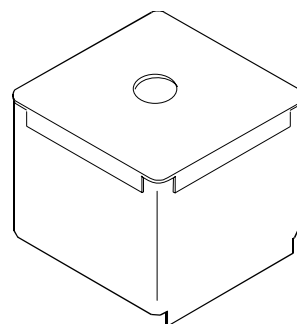
Note

If a USB converter such as the AX-USB-25P is used for communication between a PC and multiple balances, communication may be unstable.

When building into a system, use the Ethernet interface (OP-08).

OP-19: Stainless steel breeze break

- Provided as a standard accessory for the AD-4212B series balance and AD-4212A-100
- Sold separately as an option (OP-19) for the other models



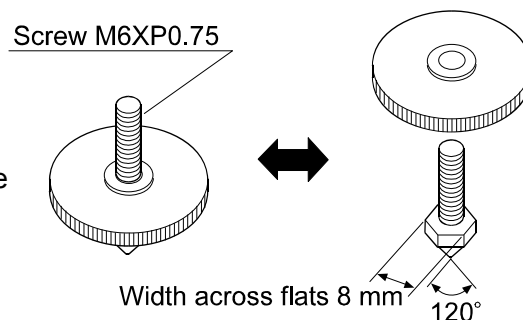
OP-20: Metal leveling foot

- It is possible to remove the plate from the screw.

When using the metal leveling feet, the height to the top of the weighing pan will be:

88-98 mm: AD-4212A-100/200
AD-4212B series balance

90.5-100.5 mm: AD-4212A-600/1000



29. TERMS/INDEX

Terms

Stable value	The weight data when the stabilization indicator appears.
Environment	Ambient conditions such as vibration, drafts, temperature, static electricity or magnetic fields which affect the weighing operation.
Store	To save the weighing data, unit mass, calibration data or upper/lower limit values using the data memory function.
Calibration	Adjustment of the balance so that it can weigh accurately.
Output	To output the weighing data using the RS-232C interface.
Zero point	A weighing reference point or the zero display. Usually refers to the value displayed when nothing is on the weighing pan.
Data number	Numbers assigned sequentially when weighing data or unit weight is stored.
Digit	Unit of digital resolution. Used for the balance, the minimum displayable weighing value
Tare	To cancel the weight of a container which is not included in the weighing data.
Mode	Balance operational function.
Re-zero	To set the display to zero.
GLP	Good Laboratory Practice.
Repeatability	Variation in measured values obtained when the same weight is placed and removed repetitively. Usually expressed as a standard deviation. e.g. Standard deviation=1 digit: This means that measured values fall within ± 1 digit in the frequency of about 68%.
Stabilization time	Time required after a sample being placed, until the stabilization indicator illuminates and the weighing data is displayed.
Sensitivity drift	An affect that a change in temperature causes to the weighing data. Expressed as temperature coefficient. e.g. Temperature coefficient = 2 ppm/°C : If a load is 100 g and the temperature changes by 10°C, the value displayed changes by the following value. $0.0002\%/^{\circ}\text{C} \times 10^{\circ}\text{C} \times 100 \text{ g} = 2 \text{ mg}$

Index

Keys and symbols

C_R	Carriage return	39
L_F	Line feed	39
\square	Space mark	39
HI OK LO	Comparator indicators	14
FAST MID SLOW	Weighing speed indicators	14
	Interval memory active indicator	14
	Interval memory standby indicator	14
	Processing indicator	14
	Stabilization indicator	14
	Standby indicator	14
	CAL key	14
	MODE key	14

	ON/OFF key	14
	PRINT key	14
	RE-ZERO key	14
	SAMPLE key	14
	100% reference mass	52

- A -

A&D standard format	36
AC adapter	9, 10, 13, 34, 41, 83
ACAI	51
Acknowledge code	69
AD-1683 DC static eliminator	11, 94
AD-1684 Electrostatic field meter	94

AD-8121B	65
Ambient humidity	11
Anti-static agent	11
Anti-static wrist strap	12
<i>AP-b</i> Auto print difference	31, 65
<i>AP-P</i> Auto print polarity	31, 65
<i>Ar-d</i> Zero after output	31
<i>At-F</i> Auto feed	31, 65
Auto display-OFF	29, 34
Auto display-ON	5, 9, 29, 34
Auto print mode A	30, 35
Auto print mode B	30, 35

- B -

<i>bASFnc</i> Environment Display	17, 29, 40, 43, 46
<i>bEP⁺</i> HH buzzer	30
<i>bEP⁻</i> HI buzzer	30
<i>bEP₋</i> LL buzzer	30
<i>bEP-</i> OK buzzer	30
<i>bEP₋</i> LO buzzer	30
<i>bPS</i> Baud rate	32, 65
Breeze break	6
Breeze ring	6
<i>btPr</i> Data bit, parity bit	32

- C -

CAL key	14, 17, 22
Calibration	13, 21, 22, 47, 96
Calibration report	23, 47
Calibration test	21, 47
Calibration weight	9, 21, 22, 23, 24, 25, 77
Calibration weight error	79
Capacity indicator	14, 29, 34
Charged material	11
<i>[L RdU]</i> Clock	29, 38, 40, 47
Clock battery error	80
Command list	68
Commands to control the balance	68
Commands to query memory data	68
Commands to query weighing data	68
Communications error	80
Comparator function	42
<i>[and]</i> Condition	20, 29, 33
Conductive acrylic fiber	11
Counting mode	50
<i>[P]</i> Comparator mode	30, 42
<i>[P Fnc]</i> Comparator	30, 42

<i>[P HH]</i> Secondary upper limit	30
<i>[P H₁]</i> Upper limit	30
<i>[P LL]</i> Secondary lower limit	30
<i>[P Lo]</i> Lower limit	30
<i>[Pout]</i> Comparator output	30
<i>[P-r]</i> Comparison results	30, 45
<i>[P-t]</i> Comparator output setting	30, 42
<i>[rLF]</i> Terminator	32
CSV format	38

- D -

<i>dAtA</i> Data memory	31
Data memory	53
Data number	38, 96
Decimal point	29, 34
Digit	29, 31, 34, 96
Discharge	11
Display refresh rate	29, 34, 82, 83
<i>d-no</i> Data number output	31, 38
<i>dout</i> Data output	31, 65
DP format	37
Smart range function	4, 19
Dump print format	37
Dust guard	6

- E -

Earth ground	11
EC, E00	80
EC, E01	80
EC, E02	80
EC, E03	81
EC, E04	81
EC, E06	81
EC, E07	81
EC, E11	79
EC, E20	79
EC, E21	79
<i>ErFnc</i> Extended functions	32, 75
Error codes	69
Excess characters error	81
Extended functions	26, 32, 74
External contact input	64


- F -

FAST	4, 20, 33, 82, 83
Format error	81

- G

GLP	Capacity indicator	29, 34
GLP report		21, 46, 47
Gram mode		18

- H -

		4, 42, 43
Hold	Hold function	29, 33


- I -

ID	ID number setting	32
ID number		38, 46
INF	GLP output	31
Inhibit		26
Initializing the balance		27
Insulators		11
Internal error		79
Int	Interval time	31
Interval memory mode		36



- K -

Key mode		35
Key mode B		36
Key mode C		36
KF format		37

- L -

Linearity		82, 83
		4, 42, 43

- M -


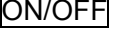
Memory full		80
Memory type error		80
		20
Minimum 100% display		82, 83
Minimum 100% reference mass		82, 83
Minimum unit mass		82, 83
Minimum weighing range		4
Minimum weighing value display at start		29, 34
	key	14, 20, 40, 41
Mounting fixture		7, 91
MT format		37

- N -


NU format		37
-----------	--	----

Number of samples		82, 83
Numerical format		37



- O -

		4, 42, 43
	key	14, 18, 26, 34, 68
OP-01	BCD output/External contact input	94
OP-04	RS232C/Five-level comparator contact output	94
OP-07	Extension cable	94
OP-08	Ethernet interface	95
OP-19	Stainless steel breeze break	95
OP-20	Metal leveling foot	95
Operating environment		83
Overload error		79
Pan boss		85


- P -

Pan support		6
Parameter setting error		81
Percent mode		52
Permit		26
Plastic		11
Pnt	Decimal point	29, 34
P-off	Auto display-OFF	29, 34
P-on	Auto display-ON	29, 34
Powdery samples		11
Precision range		16, 19
	key	14, 17, 26, 35, 49
Prt	Data output mode	30
P-tr	Tare at start	29, 35
PUSE	Data output pause	31

- R -

Reference sheet		5, 6
		20, 77
Repeatability		77, 83, 96
	key	13, 14, 19, 22, 40, 52
rng	Minimum weighing value display at start	29, 34
RsCom		66
RsKey		66

- S -

	key	14, 17, 18, 19, 22, 24, 26, 40, 50
Sample mass error		79
Self-check function		77
Sensitivity drift		82, 83

5- id	ID number output.....	31, 38
SLOW	20
5Pd	Display refresh rate.....	29, 34
Stability band width.....		29, 33
Stability error.....		79
Stabilization time.....		4, 82, 83, 96
Stable value.....		20, 96
Standard range.....		16, 19
Static charge.....		11, 12
Static electricity.....		11, 78, 79, 87, 89, 96
5t-b	Stability band width.....	29, 33
5-t d	Time/Date output.....	31
Stream mode.....		35

- T -

Tare at start.....		29, 35
Timeout error.....		81
t r c	Zero tracking.....	29, 34
t -UP	Timeout.....	32

- U -

Undefined command error.....		80
------------------------------	--	----

Unit	Unit.....	32
Unit mass.....		50
Unit mass error.....		80
Units.....		14, 15

- V -

Vibration.....		11
----------------	--	----

- W -

Warm up.....		9, 10, 13, 18
Weighing capacity.....		4, 13, 34, 79, 83
Weighing pan.....		6
Weighing pan error.....		79
Weighing speed.....		9, 14, 20, 33
Weighing unit connection error.....		79
WinCT.....		5, 6, 66, 67

- Z -

Zero point.....		23, 25
Zero point drift.....		33
Zero tracking.....		29, 34